December 1954 · 35 Cents

Astounding SCIENCE FICTION

Mars seen from Phobos

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Annotation

One of the great problems has always been, “Who can teach the best and most advanced experts?” The answer's easy... but a method of making it work? For how can a man teach himself?

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Raymond F. Jones
The school

The instrument house at the edge of the runway was crowded with the high brass and top-drawer engineering staff of Firestone Aviation Corporation. They peered over one another's shoulders and jockeyed politely for better views of the three-foot television screen at one end of the room. It showed the interior of the pilots' compartment of the XB-91 now flying somewhere above them at an altitude of fifty thousand feet.

In the front row of observers Major Eugene Montgomery watched with a feeling of elation inside him. The Ninety-one seemed almost as much a personal triumph for him as it was for the engineers who built it. He had witnessed its building from scratch and some part of him was up there flying with it.

The Ninety-one was the first genuine battleship of the air. It was a city-smasher, capable of going to any spot on the globe and doing its work. Its armament assured a better than ninety per cent chance of destroying all opposition and returning safely.

The instrument panel occupied most of the picture. Now and then there was a glimpse of the side of test pilot Parker's face. Out of sight, on the other side, was co-pilot Marble.

Parker's voice came over the speaker. "Turning now to retrace course. Altitude fifty-two thousand, air speed eighteen seventy-five, temperature minus forty-eight point seven —" He spoke in a professional monotone that failed, however, to hide his enthusiasm for the ship, too.

A score of small sounds filled the room. The whir of cameras recording the picture and voice from the plane, the background whine of the ship's jets, the click of telemetering relays. Abruptly, Montgomery turned to find his close friend and the man most

responsible for the success of the Ninety-one. He spotted Soren Gunderson at the very back of the group.

The chief engineer of Firestone Aviation wasn't even looking at the screen. He couldn't, Montgomery saw as he came up. There were too many heads in front of him.

Gunderson sat on the edge of a desk drawing hard on a pipe cupped in his right hand.

"It looks like you've really got it made," said Montgomery. "This is better than anything we dared hope for!" Gunderson nodded without expression. Parker's voice came on again. "Entering course — autopilot on — throttles maximum —"

The faint beep of the electronic timer signaled the passage of the XB-91 through the first of the radar marker beams. Seconds later, another beep sounded the completion of the ten-mile run. The men in the room waited in silent attention as the timer operator checked his instruments — all except Soren Gunderson. He seemed scarcely interested in what was going on in the room as he sucked meditatively on the pipe.

"Twenty-three eighty-five point seven eight two," the timer technician announced.

A restrained murmur arose from the executives, engineers, and Air Force men as they turned to each other with pleased smiles. Jacobs, President of Firestone, came back to Gunderson and shook his hand. "It's a wonderful ship, Soren," he said. "I'm sure that now we can forget about that other little matter —"

"On the contrary," said Gunderson. "This is the time. Make my resignation effective as of the moment the Ninety-one is accepted."

Jacobs' face clouded. "I hope you don't mean that. Come up to my office after lunch and we'll see if we can't thresh out something."

"Sure," said Gunderson. "I'll come up."

The group cleared rapidly from the room to watch the landing of the plane. Gunderson and Montgomery remained alone.

"What's this talk about a resignation?" the major asked. "You're leaving Firestone and going somewhere else?"

Gunderson stood up and nodded. "Yes, I'm going — somewhere else."

"I can imagine you've had plenty of offers, but I would have thought Jacobs would top any of them to keep you on, especially after the success of the Ninety-one."

Gunderson grunted and looked through the window to the runways. The plane was not yet in sight, but the group of engineers and brass were standing immobile, awaiting it. Gunderson smiled faintly. The plane makers didn't often allow themselves to be awed by their own creations, but this was one time they could not help it.

The engineer turned back to Montgomery. “Two hundred and eighty-five tons, sixteen engines, three quarters of a mile per second — and it’ll do even better when they check it out at seventy thousand, where it belongs. The biggest and the fastest — all in one ship. The Air Age makes progress, Monty!”

Montgomery’s eyes narrowed at the bitter smile on Gunderson’s face. He was used to his friend’s sudden inversions, but this was more unexpected than usual. “What’s wrong, Soren?” he said. “Is there something about the Ninety-one you haven’t told us?”

Gunderson was a rather small man of forty-eight. His hair was beginning to gray on the sides. As he sat hunched on the stool now, drawing on his pipe, he looked almost wizened.

“There’s only one thing wrong with the Ninety-one,” he said at last. “It’s a failure.”

“Failure —!” Montgomery’s face went white as he thought of his own position among the Air Force experts preparing to accept the ship. “What are you talking about? It’s —”

Gunderson’s head nodded rhythmically. “The biggest, the fastest, the heaviest, the most monstrous — It’s the final spawning of a long line of monsters. And, unless we’ve lost our senses completely, it’ll be the monstrosity to end all monstrosities.”

Montgomery relaxed. With the tension of the work now safely past him, Gunderson was feeling free to ride one of his hobbies again. The major wasn’t sure just what this would turn out to be, but he prepared to listen sympathetically.

Gunderson saw the change in his face and understood what he was thinking. “You’re going to believe every word the picture magazines say about our beautiful Ninety-one, aren’t you?” he said.

A thin, high whine began to fill the air as the ship soared overhead, still high, maneuvering for an approach to the other end of the field.

“They’ll give it a two-page spread,” Gunderson went on. “The Ninety-one in the middle — around it little pictures showing it generates as much power as thirty railroad engines, enough heat to warm a town of fifteen hundred people, has enough wiring to take care of the town’s power and telephone system, more radio tubes than —”

“And the citizens will lean back and sigh: Progress!”

The whine grew to a thundering roar that drowned their voices. The mammoth landing gear smashed against the earth as Parker eased the bomber down. It rolled at a crazy speed, fighting the drag of wing flaps and brakes. Its thunder shook the walls of the instrument house and the hangars and the distant plant.

Then it was still. Parker was smiling broadly and shaking hands

with himself behind the windshield. The red tractor began rolling out on the field.

There seemed to be pain on Gunderson's face. "You ugly devil!" he murmured to the gleaming ship. He swung around to Montgomery. "Let's get out of here!"

Major Montgomery was Liaison Officer between the Research and Development Command of the Air Force and the Firestone Aviation Corporation. He thought he had come to know Soren Gunderson as well as he knew the XB-91, but the chief engineer's reaction to the successful test flights of the ship certainly made him feel more than a little uncomfortable.

They drove a half mile from the plant and settled behind a secluded table in George's Spaghetti House, where a good many past conferences between them had ironed out discrepancies between hard engineering fact and the specifications of the Air Force. Montgomery watched his friend out of the corner of his eye and decided to keep his mouth pretty much shut — except for such prodding as might be necessary to find out what was eating Gunderson.

George took their orders and went away. Montgomery laced his fingers back and forth and smiled. "Everyone knows that modern combat requirements have put the size and cost of aircraft almost completely out of hand," he said carefully. "But it looks to me like pretty substantial progress that we have been able to meet those requirements at all. Even five years ago the Ninety-one wasn't considered an actual possibility. Your new wing section is the only thing —"

"A monster with a gutful of electronic equipment," said Gunderson, "duplicated and re-duplicated to make sure a ten-cent resistor doesn't bring the downfall of a hundred million dollar airplane."

He brought his gaze back to Montgomery's face and smiled, "I'm sorry, Monty. I guess you've never heard me go on quite like that, have you? I usually do it alone — in the middle of the night.

"But you know I'm right. Every competent engineer in the aircraft industry knows it. Our manufacturing methods just aren't good enough — and can't be made good enough — to eliminate the duplication of components. Our design should be capable of creating a plane to perform the military function of the Ninety-one in a tenth its size and weight — and cost.

"What price tag will the production model have? We can guess at eighteen to twenty million. It's economically disasterous to put that much into a single piece of equipment as vulnerable as a plane — even one with the dubious importance of being designed as carrier for

the H and cobalt bombs. As a solution to an engineering problem, it's a bust."

"Why didn't you build the Ninety-one a tenth its present size, then?" said Montgomery cautiously.

George appeared with their orders. Gunderson unfolded the napkin and tapped the side of his head. "Here —," he said. "We haven't got what it takes up here."

"You have no right to blame yourself! With your accomplishments —"

"Not just me," said Gunderson. "All of us. Your R&D outfit, NACA, the universities, the airplane plants. Look how we operate: We spend a couple million for a new computer, six million for a wind tunnel, our reports cover miles of microfilm. R&D farms out a million or so projects all over the country.

"But do you remember the story about how the Wrights learned to warp a wing? Just the two of them, watching the shape of a little cardboard box Wilbur twisted about as they talked — and there it was.

"How many of your people are capable of catching such a tiny clue? Not the R&D supervisor who's wondering how to jack up his GS rating from 12 to 13, or the wind tunnel chief, or the computerman. Something's wrong with the way we're going about it. We've built giant data-collecting organizations under the fond delusion that this was research. We build oceans of little ingenious gadgets, thinking this is invention. And we look in vain in all this mass of data and gadgetry for the new, basic idea. It isn't there. So we build another flying monster and pat ourselves on the back."

Montgomery contemplated the long string of spaghetti dangling from his fork. "I've heard some of that kind of talk before," he said. "I always thought it was just the product of a bad week when everything had gone wrong. If it's actually true, what can be done about it? What are *you* going to do about it?"

"That's the question I've been asking myself since we started the Ninety-one on paper, a dozen years ago. I've been asking it all my life in one form or another. I don't have any answer, right now, but I'll never build another airplane unless I find it."

"But what are you going to *do*?" Montgomery insisted.

"I've saved my money," said Gunderson. "I'll do a little fishing, maybe quite a lot. And I think I may go to school."

Montgomery's hand seemed to remain suspended in midair for a small fraction of time. His eyes shot a glance of startled amazement toward Gunderson, and then he bent over the plate of spaghetti. "For a minute I thought you said you were going back to school," he said

with a laugh.

"There's no law against a man getting some more education."

"No, of course not — except that you could walk into any engineering school in the country and make their aeronautic staff look like hicks. I don't get it. Who could teach *you* anything about plane design?"

Montgomery allowed himself to watch Gunderson more closely now as the engineer replied somewhat absently. "This isn't an ordinary school I'm talking about. I started hearing stories concerning it about six months ago. Norcross, from Lockheed, was the first to mention it. He wrote that he'd quit his job and was doing some advanced study at this place. I thought he was crazy. Then I began hearing from some of the others, all inviting me down to join them."

"What are they doing? Who runs the school? I never heard of anything like that."

"That's the peculiar part. I've asked, but they act almost cagey about details of what they're doing. Yet they're all overwhelmingly enthusiastic about it. A couple of men named Nagle and Berkeley are operating it privately. You may remember they got quite a bit of publicity a year or so ago because of a large rumpus they stirred up in regard to the patent situation. It was enough to get a Congressional investigation and it looks like there'll be changes in the Patent Law."

"I remember," said Montgomery. "R&D people didn't think much of their antics."

Gunderson smiled. "I don't imagine they would!"

"I know Norcross," said Montgomery. "He's very good. I can't imagine any kind of school that could teach him or you anything at all about aircraft engineering."

"Neither can I. But I want to find out. I've reached a dead end. The whole industry has. The engineers know it and continue to whistle in the dark, hoping for some miracle to pull them out of the hole — atomic engines small enough to go in a fighter ship, at a price not more than twice that of a jet — some way to reduce the fantastic spread of components we have to jam in —

"There won't be any miracle. There'll have to be a change in the basic kind of thinking we're doing. Less of the six million dollar wind tunnel brand, and more of the little cardboard box variety!"

Montgomery returned to the plant with Gunderson, in a state of excitement he tried not to show. But it was tinged with regret, too, because he and Gunderson had become very good friends during the time of building the mammoth bomber. He left the engineer at the entrance to the giant hangar where the Ninety-one had been pulled in for postflight checking. He hurried to his own office on the ground

floor of the plant administration building and closed the door, locking it carefully.

Then he sat down at his desk and put in a call to his Washington superior, Colonel Dodge. It took twenty minutes to locate the colonel, but at last Montgomery heard his distant, rough voice.

"I have some information," said Montgomery. "It would be best to scramble."

"All right. Code twelve," said Dodge.

Montgomery pressed a sequence of switches on the little box through which the phone wire ran. His voice thinned out as he spoke again. "It's that matter you told me to be on the lookout for six months ago. It's finally happened here. Soren Gunderson is resigning. He says he's going back to school."

"Not Gunderson, too!" said Dodge bitterly. "It's an epidemic. To date, almost two hundred men have resigned from highest priority military projects — all giving the excuse of wanting to attend this mysterious school. It has bogged down over thirty big projects, because they weren't just run-of-the-mill engineers. They were chief engineers and project engineers and top designers. The whole military program of the nation has been slowed measurably by this draining away of key personnel.

"I'm telling you this to emphasize the absolute necessity of finding out what is going on and putting a stop to it."

"Do you want me to follow through on it?"

"Just a moment." There was a click of circuit switching and the colonel's voice came back. "I've put Dr. Spindem on the line. As head of the Psychological Service Section of R&D, he's been consulted on this problem. I want him to talk to you."

Montgomery frowned distastefully. He remembered Spindem as a big man with a bluff, jovial front which he forgot to change outside of office consultations.

"Hello?" said Spindem. "It's good to talk with you again, major."

"Yes," said Montgomery.

"I understand you are personally well acquainted with this man, Gunderson."

"We've been very close friends for almost four years."

"Well, what we're after now is to get one of our men into this so-called school. We've held off any action against them so far, hoping for a chance like this. You're our first real opportunity. Do you suppose you could get an admission to the place through Gunderson?"

"I don't know. Admission seems to be by very select invitation. It goes only to the very best men in the field, apparently. My own qualifications in this regard —"

"You'll have to do whatever you can, major. This is important. Do

your utmost to utilize Gunderson's friendship to get you admitted to the school for a personal inspection. We've been able to find exactly nothing so far. It appears, on the surface, to be one of the most cleverly designed sabotage schemes ever encountered. It seems to have an unshakable hold on the minds of those attracted to it — and they are minds essential to the nation's military preparedness."

"Consider those your orders," Colonel Dodge said. "We'll have another man ready to move into Firestone when you leave. And I want a daily telephone report of your progress."

Colonel Dodge heard the distant click of Montgomery's phone, but not of Spindem's. He breathed heavily in resignation. "Why couldn't it have been *anybody* else besides that blockhead, Montgomery? We've been waiting six months to put a man there — and *he* turns out to be the first possibility."

"It's not very hopeful," Dr. Spindem agreed. "But it may turn out better than you think. In the meantime, we'd better keep our eyes open for another chance."

II.

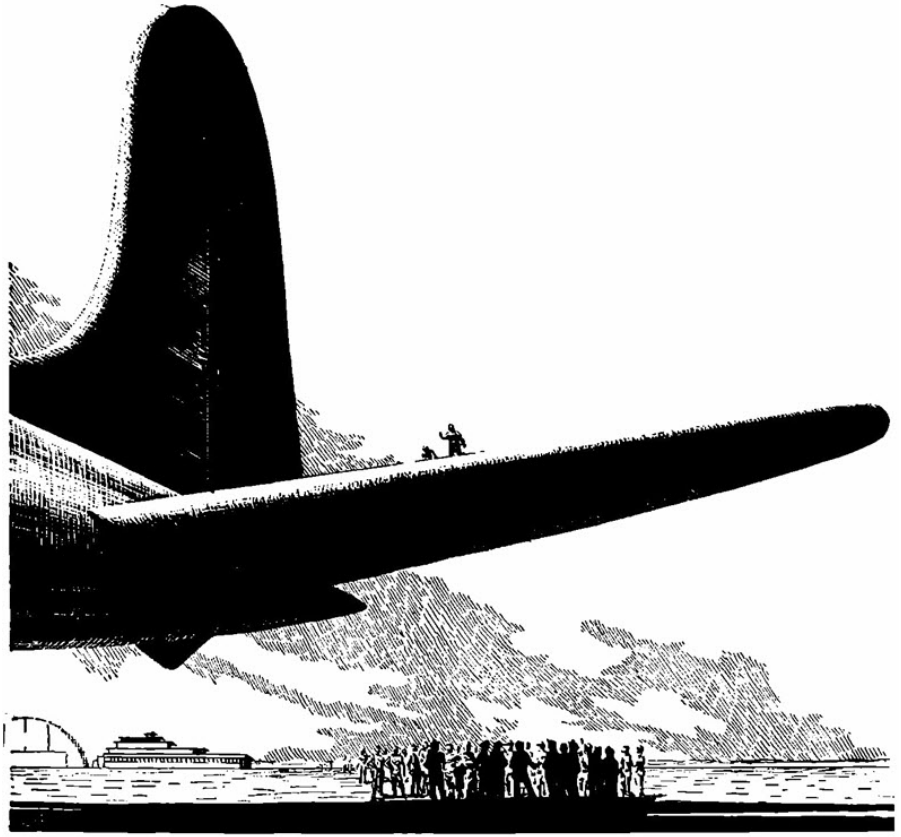
Montgomery replaced the phone and folded his hands on the desk. His eyes stared ahead, seeing nothing for a moment. This new assignment was nothing to cheer about, but he was glad he had been able to remain at Firestone throughout the construction of the Ninety-one. His contribution was not exactly visible, yet it was substantial. He knew he'd done a good job of expediting the flow of information back and forth between the Air Force and the engineers.

One thing he appreciated in the change, however, was the chance he might have to help Soren Gunderson if the engineer were going to be sucked into some foolish program that would injure himself and the nation's production. But he wondered if he actually had any chance at all of getting inside this school. It didn't seem likely that operators of the kind they appeared to be would give the Air Force a chance to come in and snoop around.

He left the office and went back to the testing area. Gunderson was busy in conference with the group of XB-91 engineers, analyzing the data of the morning's flight. So Montgomery spent an hour roaming through the ship, drinking in again the sense of power and greatness of the giant plane. He had been aboard during some of the earlier check flights, but he had never had a chance to take the controls himself. Now he went up to the pilots' compartment and sat down, wondering if he ever would get a chance to handle it. That was the one thing he still deeply desired.

The XB-91 was representative of the new concept of bombing planes, the invincible, self-contained fortress of the air. It flew alone, high, and twice as fast as sound. The approach of any object during flight, interceptor plane or guided missile, triggered the Ninety-one's defenses. Automatically, at such approach, the bomber spit out its own target-seeking missile to destroy any attacking device at a safe range. It wasn't vulnerable, as Gunderson said, Montgomery thought. It was the most completely invincible machine ever devised.

But something of what Gunderson had said that morning continued to nag at Montgomery as he moved along the catwalk, inspecting the empty nests that would hold the target-seeking missiles. It was true there was a kind of vulnerability built right into the ship — the vulnerability of its nightmare complexity. It would be nice to have simpler answers to complex problems, but where were they going to be found? If men like Gunderson couldn't devise them, who could?



The chief engineer was alone in the hangar office when Montgomery came down from the plane. He waved a hand through the glass partition and walked into the room without knocking.

"The Ninety-one doesn't look as if the speed runs shook her to pieces," he said.

Gunderson was looking half-pleased with the sheaf of papers under his hands. "No, we discovered one small area of vibration near the tail that's not good. But I think we can clear it up with just a little modification of the frame at that point."

Montgomery sat down. "Something's been bothering me. I can't get out of my head the business you were talking about this morning. This school thing —"

Gunderson nodded. "I've found it pretty hard to keep off my mind, too."

"I've been wondering — just suppose the thing does turn out to be on the level, that they've really got something there — do you think there's any chance you might be able to get me in?"

Gunderson looked at the major in surprise. "I didn't think you would be interested in anything like that."

Montgomery smiled easily. "I suppose I've been a soldier long

enough to acquire something of that Army Look, but actually I'm perfectly aware of the truth of the things you said this morning about the unmanageable complexity of the Ninety-one. If this school has got something that will draw men like Norcross and you, I think I'd like to get a piece of it for myself."

"I don't know. I haven't made application yet. Could you get away?"

"Dodge has been pretty decent since I've been in R&D. I think he'd go for it, if I asked him."

"I'll do what I can," said Gunderson. "But remember, it's still a pig in a poke as far as I know anything about it."

"I'll gamble with you on it," said Montgomery.

Six weeks later, modifications were completed and the Ninety-one was accepted by the Government. Almost simultaneously, Soren Gunderson's application was accepted by the Nagle-Berkeley Institute, and he was invited to bring his associate, Major Montgomery, for interview.

Colonel Dodge chafed daily on the phone regarding the inaction during that period, and did everything he could to speed up the acceptance of the plane. Thirty other men left critical positions in various parts of the nation during that time, but Major Montgomery remained the only R&D man who had a lead that could take him to the school.

Also, the first score of men had come out of the school and were applying again for places in industrial and scientific jobs. Some asked re-instatement with their former employers, others sought entirely new areas of activity. None would make any comment regarding his absence.

Official word had gone out quietly, however, that until more was learned of the school the applications of these men were to be held in abeyance. They were not to be hired even as janitors in critical plants. On the other hand, it was desired to avoid any investigation that would appear as a frontal attack and scare off the operators of the school prematurely. Dodge managed to convince *his* superiors and the FBI that Montgomery offered their best opportunity.

The Institute was located in the small northern California town of Casa Buena, on the coast near the Oregon border. Montgomery drove from Seattle alone, following Gunderson and his family by a day. It had been decided that Montgomery's wife, Helen, and their two children would remain where they were since this might be a quite temporary assignment.

The major checked in at one of the two resort hotels as soon as he arrived in Casa Buena. His next act was arrangement of the phone

scrambler and a report to Dodge — and to Dr. Spindem, who listened in on most of his conversations. This fact inspired a persistent irritation like that of an irremovable splinter in the hand.

It was midafternoon, but when he finally called Gunderson he was told to hurry over. Their initial interviews could be taken care of at once.

The school was at the edge of town on a low bluff overlooking the ocean. It occupied a set of old California-Spanish style structures that once housed an unsuccessful summer resort. Heavy foliage screened it from the road. The interior court had been landscaped to a Mediterranean garden — with only a slight touch of Hollywood. It formed a kind of "campus" on which numerous students lounged in the shade as Montgomery and Gunderson walked toward the administration building. Montgomery could not help staring as he recognized at a distance the features of men whose brains literally controlled large segments of the aircraft industry.

In the office, a secretary took their names and announced their presence over the interphone.

"Dr. Berkeley will see you, Mr. Gunderson," she said, "and Dr. Nagle will see Major Montgomery."

Montgomery felt a spasm of apprehension. The success of his whole operation here depended on the next few minutes. He managed to grin back at Gunderson as the engineer held up a circled forefinger and thumb. Then he was gone.

A door opened to Montgomery's left and the girl ushered him into the presence of a pleasantly sharp-eyed man in his middle forties. "Dr. Nagle," said the girl, "this is Major Montgomery."

"Come in, major," said Dr. Nagle. "We already know something of your background, and it was indeed a pleasure to receive your application."

They sat on opposite sides of a large, mahogany desk and surveyed each other a moment. "One of the first things we like to know," said Dr. Nagle, "is why a man chose to apply for admission to the Institute in the first place."

Montgomery's face sobered. He paused a long moment, both for the hoped-for effect of impressing Nagle — and to collect his own full quota of reassurance. He had rehearsed this to himself for the last six weeks. Now to see if he could put it over.

"As you may know," he said, "Soren Gunderson and I have worked closely together during the past four years in building the XB-91." As Nagle nodded, Montgomery went on. He borrowed as closely as he dared the bitter objections Gunderson had made to the Ninety-one. He modified and embellished, adding items of his own, all

the while watching carefully the reactions of Nagle's expression.

"Soren and I have felt there ought to be some answer to this inadequacy of our engineering. When he began hearing about the Institute, I was immediately interested also in the possibility that some solution had been found. Of course, I was frankly dubious," he said with a smile. "You can't expect a man not to be — but I decided I wanted to find out for myself."

Nagle's expression changed but little during Montgomery's story. As the engineer finished, he said, "Did you do anything during the building of the plane to try to eliminate some of these troublesome complexities?"

"Well, yes — during the time the wings were in design I felt there ought to be another answer to the tremendous demand for lift at the ship's service altitude. It was just a fuzzy sense that there ought to be some other way of building it. I worked out a few sketches on my own, but nothing came of it."

Nagle remained silent, watching him as if speculating over the truth of his statements. "Gunderson calls his plane a monster — a failure," he said finally. "And he's right. From an engineering standpoint the thing is quite ridiculous. It's the end product of our 'bigger and better' creed, which has been our standard for some time. Bigger planes, bigger automobiles, bigger plants — laboratories — schools — houses. You know how it works in your organization. A supervisor rates a grade higher when his personnel reaches thirty in number, so he phonies up enough projects and recruits the additional men. For every honest administrator there are a dozen empire builders working their pet researches into the status of major projects — with them at the head."

Montgomery started to protest involuntarily. "R&D isn't —"

Nagle cut him short. "The problem has been with us for a long time, but only in the last decade has it been felt as severely as it is right now. Our need for creative engineering and design has been more intense than ever before, and we have increased our efforts to obtain it proportionately. The result has been to greatly magnify all the obstacles which have always stood in our way.

"We have become aware that we are in the midst of a famine of genuine, new basic ideas. The XB-91 is a monument to this famine. It was built from the mountains of data we have collected, but it is not the product of invention and research."

"The nation has done everything possible to foster technological growth," said Montgomery. "Our engineering schools have never operated at the peak they now are."

Nagle smiled slowly as if enjoying a joke briefly at the major's expense. "You are quite right. More schools and more engineers than

ever before. Yet the problems represented by the XB-91 are not being solved by the kind of thinking coming out of our engineering schools today."

"Why not? Do you consider the schools themselves responsible?"

"Actually — no, the schools are not responsible. There are scores of factors, but standing well out in front is our misevaluation of what public education is supposed to accomplish."

"Certainly, one of its major aims is to produce an adequate corps of creative engineers!"

Nagle shook his head. "No. But in order to understand the failure of any mechanism it is best to inquire if the mechanism was designed to perform the failed function in the first place.

"The school is a peculiar institution. Even its personnel are regarded as public property. The control imposed by a community upon its school-teachers has long been a stock source of humor, but there's nothing funny in it to anyone who's ever experimented with making the school anything but the strict, literal voice of the community.

"Educational systems have always been a source of public pride, whether in Rome of the fourteenth century, or Paris, or London, or Podunk Corners, U.S.A. New advances in education are announced with great fanfare. In reality, however, the school never changes. Its basic purpose today is the same as it was when Egyptian boys studied the Book of the Dead to learn how departed souls must act to obtain happiness.

"It existed in the ancient synagogues, the military barracks of Sparta, the gymnasiums of Athens, the harsh discipline of Roman schools. It was in the church schools and universities of the Middle Ages, as well as in Napoleonic France where the system was geared to reverence for the new emperor, 'given by God.' It's painful to attempt an evaluation of our own current system, but the basic purpose is there.

"In all ages the educational system has existed to enable the individual to become an integral part of his cultural life — whatever form that culture might have."

"That doesn't sound extremely ominous," said Montgomery.

"I haven't said that it is. Judgment on that point will be left up to you. But let us consider the system in engineering terms:

"A culture demands a certain minimum degree of stability for its existence. Uniformity of customs, thoughts, and habits contributes to this stability. Likewise, there is demanded a heavy checkrein on excursions too far away from the cultural norm. Both of these items, the uniformity and the restraint, can be very adequately provided by indoctrination in the Traditions of the Elders, by dispensing All That is

Known of the Universe and Man in the sixteenth century, or by wrapping up the results of much data collection in a Handbook of Wing Design for aeronautical engineers.

"This represents a homeostatic process. The school is the instrument designed to carry it out. It's the thermostat on the stove to keep the pot from boiling over."

"If that were true, the school would be responsible for keeping things as they are — not for venturing into the new and unknown!"

"Exactly," said Nagle. "An educational system forms a homeostatic control over the natural adventuresomeness of the individual human mind to keep it in line with established patterns. It preserves the cultural ideal at all costs through widespread indoctrination with the particular mass of data currently accepted as 'truth.' *This is its only function*"

"I should think that would be extremely difficult to prove."

"On the contrary, it is so obvious it requires nothing more than calling attention to it. It is more than amply demonstrated by the fact that no educational system has ever been able to concern itself with the basic object of its ministrations: the *individual* human brain. The enormous range of variation in human minds has been taken into account only as something to be flattened out so that whatever curriculum is in vogue can be injected with minimum effort. No effective program to investigate these variations and harness their usefulness has ever been established. Earnest people have thought upon the problem from time to time, but they seemed unaware that the educational system is basically unable to do anything but what it is doing."

"This sounds rather rough on the educators."

"Not at all! They're fulfilling the function assigned by society long ago when the first half dozen families gathered outside the communal cave and decided little Joe Neanderthal was getting too big for his britches and somebody was going to have to teach him a thing or two. They've been teaching him ever since this first school was set up. There are many social homeostats outside the family now, but the school was the first — and the function of a homeostat is to flatten variations."

Montgomery laughed. "I suppose everyone has that kind of feeling about his education at times — although I'm not yet convinced your description is wholly accurate. I do remember seeing at one time, however, a picture of an ingenious machine to stamp walnuts with a brand name. Regardless of the shape or size of the nut it came through the machine with the same brand as all the rest. I thought then that schools had also been stamping the nuts with identical brands for a long time."

Nagle smiled broadly and nodded. “They deal in terms of classes, not individuals, of materials to be taught, of obtaining agreement from the pupils, not of inviting them to original thought. We laugh now at little Joe Genius being held down by the backwardness of the Little Red School-house on the prairie, and exult in his eventual triumph over it. We fail to recognize that the Little Red School-house is still with us — even though it now has air-conditioning, glass bricks, and cantilevered roofs. We fail to recognize that discovery and invention are culture-smashing activities, and education is a culture-preserving mechanism. By its very nature, then, education cannot sponsor any vital, new departures in any facet of our culture. It can only appear to do so, to preserve the sustaining illusion of progress while at the same time maintaining the homeostasis of the culture.”

“And all this leads to what?” said Montgomery.

“To the question of what happens to a working system when the setting of its homeostatic control is pushed down too low!”

Montgomery shifted uncomfortably. He refused to believe the arguments Nagle was proposing, yet he wasn’t quite sure how he would have refuted them if he had been in a position to do so.

“I suppose in that case,” he said, “the fire goes out. You believe this has happened?”

“It is happening,” said Nagle, “at an alarming rate. Education is being substituted for learning. Data-collecting is taking the place of research.

“Perhaps no period of our culture has seen a more optimum balance between the two than the last thirty years of the nineteenth century and the first decade of this one. Education was widespread enough to enable a country the size of the United States to function as a unit — and limited enough to keep from smothering the culture-shaking activities of the Edison-Ford-Wright type. We have to work toward a restoration of that balance.”

Montgomery shook his head — not too vigorously, in view of the necessity to not antagonize Nagle. “Cultures can’t be static structures trying to avoid all change,” he said. “They don’t last very long if they are. To exist, a culture must be a vigorous, growing entity. Ours is — and in my opinion our educational system is largely responsible for it. For every invention of the Edison, Ford, or Wright type you’ve got a thousand others produced quietly in industrial and university research centers, and each is just as important in its own way as the work of the barefoot boys who sold newspapers. After all, the atom bomb didn’t come out of somebody’s basement lab!”

“No — it came only after virtually all homeostatic forces involved were thoroughly shackled. We could argue the variations in thousands of instances, but that would hardly be practical.

“What is practical is to note that the situation we’re in produces XB-91's — and will continue to produce them unless a change occurs. We have to tackle the basic problems of the minds that do the thinking. We supply them with bigger wind tunnels, more complex computers. That merely evades the problem. It doesn’t solve it.

“We must find out the nature and purposes of the human being — of you and me. We have to turn our vision from the external world to the internal. This is something that science, society — our whole culture from the very beginning — has been afraid to do. We make believe we’re going after it by taking electroencephalograms, analyzing blood constituents and glandular products. But this, too, is an evasion. It tells us nothing of what a man *is* and what he’s doing - and why he’s doing it.

“And you’ve missed my point about the function of homeostatic controls. They don’t necessarily prevent cultural growth. They keep it within certain bounds. But the control must not be confused with the agency responsible for growth. That would be somewhat like confusing the thermostat with the fire!”

Montgomery felt a sense of anger growing within him for a reason he couldn’t quite name. Nagle seemed so sure he had all the answers. “What agency is responsible, then?” he demanded.

“That, my friend,” said Nagle, “is what you are here to discover for yourself.”

“And in spite of all your objections to schools it appears that you have set up still another one.”

“Our Institute has been called a school, but it shouldn’t be. Our function is primarily to reverse the activities of the ordinary school. You might — and quite correctly — say that we are engaged in *de*-educating —”

“*De*-educating —?”

“Yes. Meaning to remove the homeostatic controls imposed by your education — to whatever degree you wish them removed — and from whatever source your education was derived.”

“Even if I were to accept the possibility of this, it sounds more than a little dangerous — to both the individual and his society.”

Nagle’s eyes grew more sober. “I wouldn’t have you acquire any illusions on that point. It is capable of very great danger — to both parties!”

III.

As if the interview had already gone somewhat farther than he desired, Dr. Nagle arose from behind the desk. “I’m sure you would be more interested in seeing some of our actual procedures. Suppose we look in on some of the people.”

They left the office and went out along the loggia that led past a number of rooms. Montgomery’s heartbeat increased at Nagle’s apparent implication that there was no question of his acceptance by the Institute. If he did a good job of his assignment here and provided a thorough exposé of the crackpot theories upon which the Institute was evidently founded, he ought to be in line for a promotion.

Dr. Nagle stopped with his hand on a doorknob. “This is our music class. We’ll be breaking into the middle of a session, but it will be all right if we don’t disturb the performer.”

Montgomery started to ask what possible reason there could be for a music class in an Institute supposedly devoted to advanced technology, but he didn’t get a chance. A wave of sound burst upon them as Nagle opened the door slowly. Montgomery caught sight of an enormous stage occupied by a symphony orchestra of at least a hundred pieces. Nagle beckoned him forward and closed the door.

There was a feeling of unreality about the place. While the music crashed and sang in torrents of melody, Montgomery stared about. The room facing the stage was tiny, and there were only five men present. Four of these seemed to be concentrating their attention, not on the orchestra, but on the fifth man, whose head nodded and jerked in rhythm with the music.

“Sit down,” Nagle whispered."

The back of the sandy-haired fifth man in the group seemed strangely familiar. Montgomery shifted until he got a better side view. Then he inhaled with involuntary sharpness. It was Norcross, the top design engineer who had first interested Gunderson in the Institute. Montgomery wondered why he was the center of interest now. Possibly he was the composer of the symphony? That seemed merely fantastic. Montgomery was certain he possessed no such talent.

In spite of his tense curiosity the major leaned back and gave himself over to the flowing warmth of the music. He was no critic. He didn’t know whether it was good or not. But it *sounded* good. As it picked up tempo to an almost frantic pace, they were joined by Soren Gunderson and Dr. Kenneth Berkeley.

The face of Norcross was filmed with perspiration now. His hands beat time as if he were actually conducting the orchestra himself. Then with a triumphant crash of sound the performance came to an

end.

Norcross sank down in his chair, stretching his feet at full length and fanning his face wearily. The four other men gathered round and clapped his shoulder in hearty congratulations.

"Boy, I didn't think I'd ever make it through that last movement!" Norcross exclaimed. "I bit off a little more than I could chew."

Montgomery was scarcely listening. The stage had suddenly gone dark and the orchestra had vanished as if never there at all. And the stage was not enormous, after all. It was no wider than the end of the small room.

Montgomery was still staring as Norcross turned around and spotted Gunderson. He jumped to his feet and rushed forward with extended hand. "Soren! You made it, after all! I didn't think you were ever going to get the lead out and leave that kite factory. How'd you like my music? Believe it or not, six months ago I couldn't play a tin whistle."

Gunderson took his friend's hand warmly. "I'm no musician, but it sounded good to me. I had no idea you went in for composition. And I expected you to be spending all your time with stress analysis and engine-loading figures. How come the music?"

Montgomery interrupted before Norcross could make any answer. A slow, tight feeling was advancing along the skin of his back. "What happened to the orchestra?" he said.

As if he had made a joke, this was a cue for general laughter among all the men of the Institute. Dr. Nagle held up a hand even as he joined in the amusement. "I think we had better enlighten our visitors," he said, "before we have a blown gasket or two."

He gestured toward the stage. "There was no orchestra, of course. What you see is merely a shadow box in which the projections of the student's mind are made visible and audible. You perhaps didn't notice the small headpiece Mr. Norcross was wearing, but through it the impulses of his mental composition were conveyed to the mechanism of the shadow box and made perceptible to everyone in the room."

"You mean you composed the music and imagined the motions of the orchestra as you went along!" Gunderson exclaimed incredulously.

Norcross nodded. "It's tough going at first, but you can learn it. I hope we got a good tape. I want my wife to hear it. That's about the best one I've done yet."

Montgomery felt as if the whole situation had become completely unreal. In a moment someone would break down and give the trick away. The shadow box was some kind of movie projection device. It had to be. *Nobody* could be good enough to do what was claimed. Certainly not Martin Norcross, airplane engineer and designer —

But they were beginning to move out of the room and Nagle was speaking again. “If any of you still question the presence of a music department in an engineering school, let me assure you that what you have just seen and heard is a rigorous mental exercise on a par with anything you will ever do in creative science. You can estimate for yourselves the number of factors that must be coordinated and manipulated and kept under absolute control at all times. It is an excellent engineering practice!”

They entered an adjoining room which contained a dozen seats and had one wall that resembled a blackboard except that it was a smooth milky whiteness. At Nagle’s bidding, Norcross donned another headset. It was a small, narrow band that clamped a pair of thin electrodes above his ears.

“Show us your next electronic design problem,” said Dr. Nagle.

Norcross scanned through some sheets in a notebook. “It’s an airborne radar,” he said. “Thirty-mile range —”

Almost at once there began to appear on the white wall a schematic diagram. A little shaky at first, it grew in complexity with startling rapidity. Beside the components there appeared electrical or mechanical specifications. In a little less than ten minutes the intricate diagram was completed. Norcross took off the headset. “I think it’ll work,” he said, “but I wouldn’t want to guarantee it!”

“It will work,” said Nagle confidently. He turned to the others. “These items are part of Mr. Norcross’ graduation program, incidentally. This is the kind of routine all our students go through before they leave.”

Montgomery continued to regard the wall with the same sense of unreality that had come upon him in the other room. He touched a finger to its smooth, glassy surface. The markings were on the other side.

“We photograph them for permanent record,” said Nagle. “Except when it’s a mere practice session which the pupil does not wish to keep. For most of that kind of work, however, we use the small three-dimensional box.”

He went to the rear of the room and drew away from the wall a four-foot cube on rollers. He pressed a button at one side and the thing became luminous in the interior.

“Would you care to demonstrate?” he suggested to Norcross again.

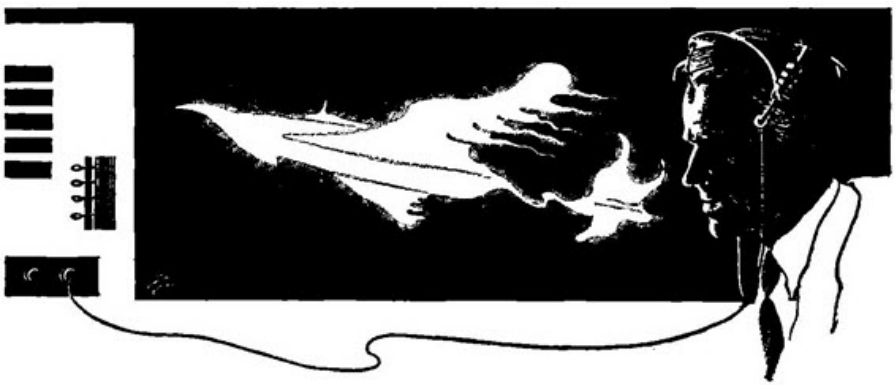
The latter plugged his headset into the side of the panel at the cube’s bottom edge. Almost instantly, a small silver airplane appeared inside the cube. Realistically, jet fire poured from the engine. The plane maneuvered as if in actual flight, diving, climbing, rolling.

“Perhaps you’d like to try it?” Nagle suggested to Gunderson.

Grinning a little nervously, the engineer took the headset from Norcross and adjusted it to his own head. He stared into the now empty interior of the cube. “What do I do?” he said.

“Build a copy of your XB-91 and put it through its paces,” Nagle suggested.

Slowly there appeared a fuzzy, highly asymmetrical outline of the Ninety-one. Gunderson laughed uncertainly at his own creation. “Looks more like the ghost ship of the Ancient Mariner. What the devil’s the matter with the engines on the right wing? They won’t fire up.”



“Turn the plane around,” Norcross suggested.

Clumsily the model turned on its own axis, the tail disappearing in the process. Gunderson restored it. The engines on the left wing were out now, while the others were going.

“Can’t keep it lit up on both sides,” he complained. He felt moisture starting out on his forehead in the strain of maintaining the image.

“That’s a lot better than most of us do the first crack,” said Norcross. “We engineers pride ourselves on our visual ability. This shows us where we really stand.”

Gunderson shook his head unhappily and took the headpiece off. He extended it to Montgomery. “Try your luck, Gene. See if you can build a Ninety-one, complete with wings and tail.”

Montgomery felt as if something had frozen inside him. He couldn’t have taken the headpiece if his life depended on it, he thought later. “No,” he said thinly. “I’m going to expose my ignorance in private, first.”

There was a great deal more to see and learn, Dr. Nagle told them, but the afternoon had grown late, and they were dismissed with the request to return the following morning. Montgomery felt shaken by what he had seen. And all the way back to the hotel he cursed the schoolboy fright that had kept him from accepting the headpiece of

the visualizer cube. He had acted like a bashful kid at a party game and he couldn't understand it. Nagle caught it, however. As if he understood exactly what was going on in Montgomery's mind, he had taken the headpiece and changed the subject before anyone else could say anything. The director had been willing to spare him embarrassment, but it increased Montgomery's irritation that it should have been so obvious to Nagle.

The prospect of making a telephone report to Dodge was another source of sharp irritation. He postponed it until after dinner, and then decided the colonel could just as well go without his report.

He took a long walk down to the beach and sat on the rocks until after it grew dark. Then, gradually, as if daring to peek through the crack of a door into some closet of nightmares, he allowed himself to consider what he had seen at the Institute that afternoon. He wanted to dismiss it all as trickery and a hoax, but it wouldn't go away that easily. Norcross appeared perfectly honest in his part of the demonstration. Montgomery couldn't see how he could have been duped after spending as long as he had at the Institute. Nor was there any purpose evident in such duping.

The only reasonable conclusion was that the engineer had been endowed with near-superhuman abilities during his slay. But Montgomery wasn't prepared to accept this kind of answer without a struggle.

When he got back to the hotel a call from Dodge was awaiting him. He wished then that he had done the calling. He would have been better prepared with a story that would sound halfway reasonable. Certainly he couldn't tell the truth over the phone. The colonel would think he'd gone crazy.

But Dodge was mostly interested in whether Montgomery was going to be admitted or not.

"I'm pretty sure they're going to let me in," said the major. "Nagle acted as if there would be no question about it at all."

"Did you get a look at anything to give you an idea what's going on?"

"No. I had a long talk with Nagle. He seems to be off on some kind of a phobia against schools. Apparently, if we burned down the buildings and fired all the teachers and professors everything would be all right, in his opinion."

The colonel grunted. "That's about the kind of thing Spindem thought we'd find. I've been thinking seriously of assigning him to come out there and work with you closely on this. The thing we need to know is how they manage to suck in the top talent of our military suppliers. They must have quite a trick to do that."

"I'll try to find out, sir, and keep you informed," said

Montgomery.

He hung up, hoping he'd be able to nail down the answer before Dodge sent Spindem out. That would be just a little more than he could take, he thought.

The following morning he was introduced to the counselor, Don Wolfe, as soon as he appeared at the Institute. Wolfe was a much younger man than either Nagle or Berkeley, but he shared the same calm assurance that he knew what it was all about. This irked Montgomery, but he hoped he could continue to keep the irritation under control and not get himself thrown out prematurely. He forced himself to listen attentively.

"Dr. Nagle gave me a run-down on the things he discussed with you yesterday," said Wolfe. "Unless you have some questions, we'll go into the matter of how the effects are produced."

"The only question is whether or not I'm being accepted for work here," said Montgomery.

Wolfe smiled. "Evidently Dr. Nagle forgot to mention that you are the one who decides that. We have quite a few people who don't stay with us very long — after they see what I am going to show you today!"

He led the way out of the office and across the court to another building. Inside this, he took Montgomery to a small room which was lined on one side with panels of electronic equipment of some kind. It was decorated pleasantly over soundproof wall board. The furnishings consisted of a couple of chairs and a table and a couch.

Wolfe indicated a chair and gestured toward the panels. "This is the Mirror — sometimes known affectionately among Institute members as Nancy the Nemesis, or Minnie the Monster. At any rate, you'll have some rare moments here if you decide to join us."

"What does it do?" said Montgomery.

"As a mirror should, it offers you a look at yourself."

Montgomery frowned. "That doesn't seem to make very much sense."

"It doesn't at first to most of the people who come here. You've been warned away from it all your life. When you went to school they gave you an I.Q. test and put a label on you, which you were taught never to question. You were stupid, average, or brilliant and there was absolutely nothing you could do about it if your category was lower than you would have liked. Your attention was directed to the exterior world as it was described to you. And agreement with that description was demanded. If you saw wiggles where woggles were described, you learned to agree that they were woggles — or you had another tag applied to you: academic failure.

"In view of these discrepancies you were more than willing to agree after a time that it was best not to try to look into this sealed box you wear on top of your spinal column. That is the almost universal attitude we encounter."

"And now I'm invited to take a look into the box, is that it?" Montgomery looked dubiously at the panels of the Mirror. "Minnie, the mechanical psychoanalyst!"

Wolfe smiled. "She's been called that before, too. But that's the one name that's wholly inaccurate from the standpoint of function. The machine does nothing to interpret you to yourself. It doesn't tell you anything or offer advice on how to adapt and get along better in the world. It does absolutely nothing but hold up a reflection for you to observe and make your own conclusions. It has only one control feature built in — and this is quite necessary. The extent of the reflection is governed automatically by your own fear level."

"Fear —!"

"Yes. You will find that in spite of the simplicity of Socrates' admonition it is quite a fearful thing to attempt to know thyself. So instead of taking a full, unobstructed view at first it is necessary to take a knothole view, so to speak. Get a tiny peek at one aspect of yourself and digest that and learn to live with it before broadening the outlook."

"I fail to see why there should be any fear involved in this — as long as a man hasn't committed some crime which he's afraid to face."

"We don't need anything as melodramatic as criminal acts. You'll see. As an indicator, however, you might consider the common, publicly acknowledged fact that Man uses twenty per cent or less of his available brain power. This is regarded quite sadly with clucked tongues about what a shame and a waste it is — but any determined effort to increase this percentage is greeted almost with fury. Psychoanalysis is a fair target for anybody's humor. To ascribe one's deficiencies to cruelties and inadequate care in childhood is to acknowledge ignoble surrender. You'll find it quite curious that there should be such antipathy toward investigating and increasing the powers of the individual. It requires a genuine self-appraisal to be effective. And this is simply too painful. It has to be fought: 'No thanks, I'm not crazy *yet*.' 'There's nothing wrong with *my* brain!'

"There are two main causes for this reaction. The deficiencies of orthodox psychiatry cause it to miss the boat more often than not. It essays to deal with the explosive forces of human esteem - inadequately. The Mirror has no such drawbacks. It permits you to ask: Who am I? What am I doing? What do I know? And gives you a source of a perfect, undistorted answer: yourself. This is strong meat, however. A full, reflexive view is loaded with absolute terror. That's

why we begin with the knothole picture and expand gradually."

"I still seem to miss the connection between all this and the ability of an engineer to build a better airplane — which was the initial incentive that brought most of us here."

"That won't remain a mystery very long," said Wolfe. "You will examine the ten thousand agreements you have made with your professors and with other engineers that This is the Right Way to Proceed. You'll examine the ten thousand agreements you've made that your ability is not sufficient to do the job before you. One by one you'll examine each of these tiny homeostats which control your thinking now — and decide whether it's worth keeping. Every derogation of yourself, every acceptance of someone else's solution to a problem without working it through for yourself, is such a homeostat. Some of them you will keep. Most you will throw away, and wonder why you ever saddled yourself with them in the first place!"

It was becoming the most incredible mass of hokum he had ever heard, Montgomery thought. If it were not for the Norcross demonstrations, which still had to be explained, he would have given up now and called for Dodge to come in and take over. He regarded the panels of the Mirror with a degree of fear as Wolfe rose and began manipulating controls there — it was not the kind of fear Wolfe had been talking about, however, it was fear of how far he could go with this mechanical hypnotic-psychoanalytic gadget without risking harm to his own brain. He wished now that he had pushed Dodge's suggestion that Spindem be sent out. As much as he disliked the psychiatrist, he felt his advice would be valuable — and protective! — now.

Wolfe was holding out a small head-piece similar to those Montgomery' had already seen. "You can try it out if you like, work with it as long as you care to — or walk out now and forget everything we've told you."

Montgomery's face felt moist. He wished he were free to take the last alternative. He thought of Dodge, and the possible promotion that might come out of his investigation.

"I'll try it," he said. "What do I do?"

"Just put this on and take it easy. You can lie down or sit in the easy-chair. When you are through take off the headpiece and the circuits of the Mirror will shut themselves off automatically."

He helped Montgomery adjust the metal tabs on either side of his skull. The major took the easy-chair and leaned back. "Nothing's happening," he said. "Something must be wrong."

Wolfe smiled. "It's working, all right. Come in to the office if you

care to when you're through."

He left the room, closing the door softly. Montgomery sat in the chair, swearing to himself — not quite so softly.

How had he ever got sucked into this in the first place?

IV.

He sat tensely for at least five minutes, pressing the tips of his fingers together and waiting for some manifestation from the apparatus. When nothing had occurred at the end of that time he allowed himself to relax a trifle. It appeared he was not going to be overwhelmed with some kind of mechanical hypnosis trying to convince him he was a five-star genius, misunderstood and unsung, anyway. How long should he sit here before going back to the hotel and reporting to Dodge, he wondered.

Of course, if he had it his way, he never would report to Dodge — ever again. Dodge was an administrative windbag who knew virtually nothing whatever of the research processes he was called upon to program and direct. It was more important to him to keep Senator Graham's sixth cousin happy as director of a study that was way over his head than it was to find a way of shrinking the size of the XB-91.

But, then, his own position was not so different. He considered it superior to that of the engineers doing the actual work. In reality, he was little more than an office boy in gold braid —

He sat up sharply. What the devil was going on? What kind of thinking was that? He held an important post — a *very* important post. Without his coordinating efforts the XB-91 wouldn't have been built for another year, at least. Anybody could push a slipstick back and forth, but it took someone who understood the engineering and possessed the administrative qualities —

His thought ceased momentarily in a swirl of confusion. He leaned back in the chair and closed his eyes, clinging to the single concept of his key importance as Liaison Officer over construction of the XB-91. He had to cling to that idea. It was suddenly of overwhelming importance.

And then it was gone. A swirl of panic surged in his belly. He felt as if he were trying to reach out for something lost and forever beyond him. But it was gone, and he glimpsed what was left.

He was not merely Dodge's kind; he was worse. He pretended to be an engineer. Dodge didn't make the pretense.

He had a degree in engineering, but he was no engineer. He never had been. He knew the formulas and he could find things in the handbooks, but a new, complex problem that had no handbook solution left him in panic. None of his kind, who spent their time telling the genuine engineers what ought to be done, could do the job themselves if it were turned over to them.

He was as close as he could get. His training had won him a commission and he'd stayed on, ending up in R&D liaison. He had to

be proud of it. It was all he'd ever have —

And now he didn't have even that. He'd forced himself never to recognize it before — that he was a fake, a phony, a completely false front hiding an unbearable incompetency. He bent forward, burying his face in his hands, and wept.

The panic subsided and a slow, diffuse anger seeped through him. He looked up at the panels of the Mirror, as if aware for the first time that the machine had something to do with the stabbing recognition that had passed through him.

He felt the pressure of the headpiece against his skull and tore it away with a single motion that hurled it against the panel, shattering a meter face and crushing the headpiece. The anger stayed with him and he wished that he might tear the place down. But Dodge would do it better, he thought with some satisfaction. He and Dodge and Spindem — they'd really rip the place apart when the time came.

He left the room quietly. He saw no one about as he went out of the grounds and across the street to his car. He drove back to the hotel and put in an immediate call to Colonel Dodge. It took only a moment to reach him.

"Montgomery," he said. They selected their scrambler code and he went on. "I got a look at the inside for the first time today. I think Spindem ought to be here."

"Just a moment, I want the doctor to hear this." There was a click and a moment of silence, then Dodge asked him to go on.

"They've got a machine," said Montgomery. "Something dreamed up by one of the original designers for the Inquisition. I had to get away from it. I felt like I was going crazy. I'm willing to bet that plenty of men have graduated from here straight to the nut house."

"But what does it *do*?" Dr. Spindem demanded.

Suddenly Montgomery wished he hadn't called. He felt like he couldn't talk about it any more. His anger was spent. He answered wearily. "I don't know. It just gets hold of your mind and suddenly you're convinced that everything you've ever done has been wrong. There's nothing right about anything."

"Are you going back?" said Colonel Dodge.

"Don't do it!" Spindem exclaimed. "I'll get away sometime tomorrow, but don't do a thing until I get there. Your sanity may depend on it."

"Don't worry," said Montgomery. "I'm not sticking my head in that noose again for anybody."

He went down to the beach in the afternoon sunshine and there he had the chattering shakes. He threw pebbles at the sea gulls wheeling over the rocks. He stomped up and down on the sand. But he

couldn't stop the trembling of his muscles.

So he wasn't really an engineer! So he had always made like a big shot to cover it up! What difference did it make? The work he'd done had been useful.

But it was no good. He slumped down on a rock and let the shaking possess him. He'd kidded himself. That's where the trouble lay. He'd kidded himself — and now he couldn't kid himself any longer. Everything that had supported him was gone. Maybe it was flimsy and phony, but it wasn't right to strip it away like this. Now that it was gone, however, he could never again walk into a conference and hold his head up as if he were the equal of the men on the other side of the table. He never had been their equal, but he had been able to function under the illusion he was their superior. Now, he could no longer function at all.

His hand grasped a weed stalk and drew idly in the sand. A wing section formed, a curiously irregular wing section that would have provoked laughter in any engineering group. But the laws of air flow and lift were not quite the same at eighty to a hundred thousand feet as they were at sea level. His section could have shortened the span of the Ninety-one by twenty per cent. He was sure of it. Why had he never tried to get it tested?

He didn't quite know. He'd told himself it was a wild idea that had no merit. Could the truth be that he had been unwilling to face the possibility of ridicule for his unorthodox engineering venture?

He didn't know the answer to that, either. He only knew that something had been taken from him that enabled him to function, and now he had to have it back, or he'd never be able to function again. He had to see Wolfe and the people at the Institute. It was a sudden obsession with him. They had taken it away; they could give it back.

It was late when he reached the Institute, but Don Wolfe was still in his office. "I rather expected you'd be back today," he said. "You gave us quite a shock when we saw the taped record of your experience with the Mirror this morning. Your fear tolerance level is higher than any we've seen yet. You've got more guts to take an honest look at yourself than anybody who's gone through here up to now. Usually, it takes a week or two to blast out as much as you got in an hour."

"I imagine I'm supposed to be pleased," said Montgomery sarcastically. "I want back what I had before. I may have been a four-flusher, but at least I got along and did a job. You took away that ability. You've got to give it back!"

Wolfe was shaking his head very slowly and smiling faintly. "There's a fundamental principle inherent in the Mirror," he said. "It

holds up an image, but it does not force you to look. You see nothing but what you are willing to see. There is only one answer for you now: go back and look again and ask yourself why you had to be content with the character of a phony big shot instead of being a productive individual in your own right."

Montgomery knew that unaccountably he was going to do it. He must have known the moment he decided to come back. The Mirror was hypnotic — or narcotic — in its effect. He had to come groveling back and see if there was any answer to the question of his inability to be an engineer honestly without the false front of his uniform and R&D assignment.

Don Wolfe accompanied him back to the room. He saw that the damage of his burst of anger had been repaired. Wolfe made no mention of it.

"I'm going to wait for you in my office. Will you come over when you're through?"

Montgomery nodded mechanically, as if in a daze. His hands were trembling faintly as he sat down and put on the headpiece. Like a hophead, he thought. You hate the stuff and can't leave it alone. How can I ever get away from this thing now?

Wolfe observed him for a moment with a slightly worried frown. "I can turn down the fear-level control a bit, if you want me to," he said. "Since your own acceptance point is so high, it might be easier on you —"

Montgomery waved him away. "Leave it alone. I want to know what goes on — I've got to find out."

He settled back and closed his eyes as Wolfe closed the door behind him. A feeling of peace and serenity began to flow through him and he knew he should have stayed that morning without breaking off in anger as he had done. He should have seen it through then.

It was strange, though, that he could regard himself almost happily now, recognizing full well the phoniness that had adorned his entire career. After the initial panicky confusion it seemed almost a relief to feel it being stripped away. It *was* a relief — and now he saw why.

A thousand fears and apprehensions had gone into the support of his false front. Every time he'd gone to an engineering conference there was a constant panic that he would make some absurd break that would bring laughter around his head from the engineers. Half the muscles of his body maintained an agonizing tension in anticipation of it. And he'd prided himself on the exhaustion with which he left those meetings. He'd go home and flop on the sofa at the end of the day and tell Helen what a "rough one we had today."

He began laughing, a slow chuckle at first that quickly rose to almost uncontrollable spasms verging on hysteria, as he caught full sight of the ludicrous spectacle he made staggering under the weight of his self-created burden that had no existence for anyone else.

Slowly, the laughter died. And the panic came back. Not as strong as it was the first time, but it was there. He felt helpless and unanchored. It was all right to laugh at himself for behaving like a fool, but that didn't change the fact that he had done the best he could under the circumstances. He *was* incompetent. He could never be an engineer like Soren Gunderson if he admitted he was all the fools who ever lived. Nothing could change the real picture of his inadequacy.

But why? he asked himself. The panic seemed to freeze a little and lose some of its violence as he probed the black screen where the shadows of himself were in hiding. He wasn't a moron. Way back in school they'd tagged him, as Wolfe had said. They gave him an I.Q. test and wired on a label. But it was a good label. It put him way up in the top one per cent of the population as far as intellectual ability went.

In spite of this he'd been a complete bust. Or perhaps because of it? he wondered. He'd once felt sorry for those far below him in the merely average levels. But they were the successful ones now. Somebody had made an extensive study once, he remembered, about high I.Q. failures. He wondered what they found out.

Probably nothing. A man should be able to answer his own questions, but there was no answer in sight as far as he could see. He'd tried to do everything right in school, from the first day to the last. Top honors, all the way through. They'd patted him on the head approvingly, as if he were a pet pup. In the grades there'd been a time when he was shunned as the teacher's favorite.

Homeostatic controls, Dr. Nagle said. What did that mean, anyway? What controls had he agreed to accept during his school days? The concept made no sense —

He gasped in sudden helplessness as if a flood poured down upon him while he sat chained, unable to move. Black waves washed forward, sweeping over him. His body strained upward, as if seeking the air, then he slumped before the flood, babbling and whimpering in terror.

He didn't know how long he lay there. It seemed as if forever, and there was a dark whispering of leaves in his ears and the flashing of bright-edged pages before his eyes. The leaves of the calendar of all the days, and the pages of all the books —

But it was utterly insane. School had not been these dark days of terror. It had been warm and friendly. Warm and friendly — while they pinned on his mind each of ten thousand tiny homeostats to see

that he never moved out of line. He was the teacher's pet with the I.Q. of a genius.

And for daring to glimpse behind their professional smiles and watch the little machines they attached to his cortex they would shake him with this terror.

He couldn't endure it. He cried out for them to take him back. He wouldn't look again, he promised. He would believe forever that they loved him and he wouldn't tell anyone about the little machines in his mind.

The black waves receded. He sat up, drenched with sweat. Drops of it fell from his chin to his shirt front. He opened his eyes dazedly and glanced up at the panels of the Mirror. I'm going crazy, he thought numbly. The machine is driving me crazy —

Nagle and Berkeley and Wolfe had found out why he was here. That was it. They knew who he was and why Dodge had sent him. He had been a fool to think they would let him in that easy. They had set the machine so that it would make a babbling idiot out of him, and when they got through with him no one would believe anything he said about the Institute. He glared up at the panels. If he could only reach up there and smash something to turn it off. But he couldn't get up. All his strength was gone. Maybe in a minute more — if he could just sit here without thinking.

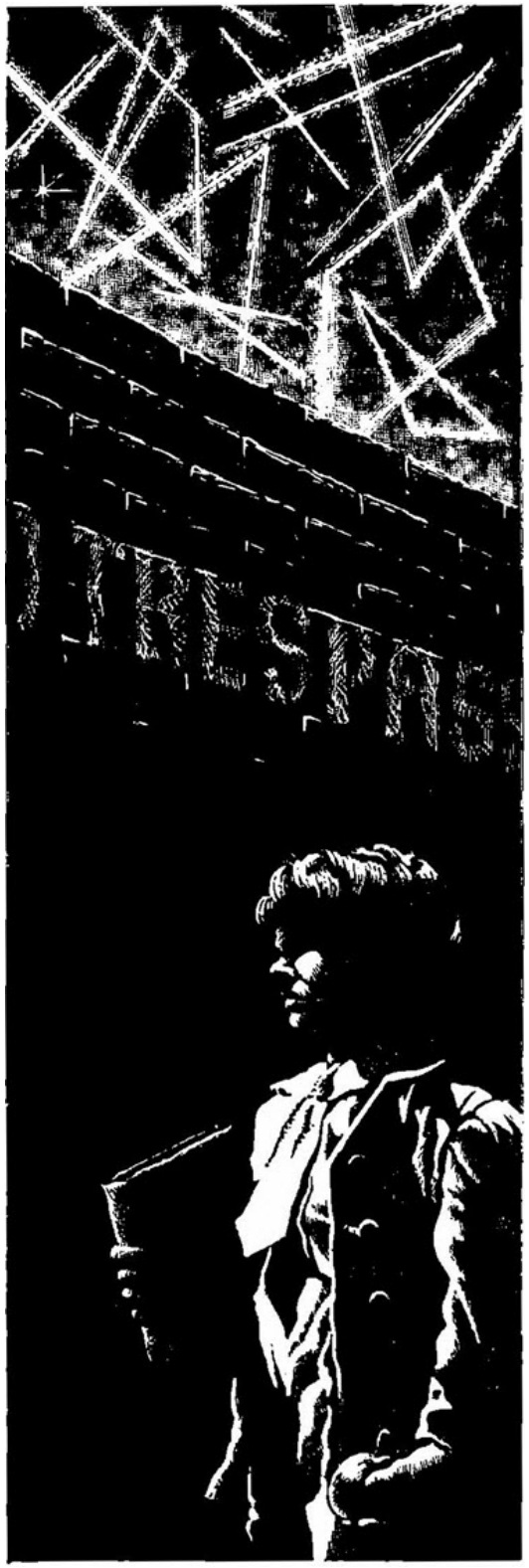
Dimly, he remembered Wolfe saying all he had to do was remove the headpiece and the machine would shut down. The thought struck him with panic again. He couldn't do that. He had to keep it on his head. He had to wear it forever, he thought —

He couldn't keep from thinking. He couldn't keep from thinking that something had gone wrong. Something terribly wrong along the line somewhere. He should have come out of school competent and able — and he'd come out a dud. It didn't matter whose fault it was. What mattered was why it happened. He'd done everything they told him to. Every single thing. He'd even let them dim the high ecstasy of new worlds.

That's what mathematics had been for him. He knew something of the history of astronomy and computation when he came to high-school geometry and algebra. He expected it to be the opening of a door to a bright, new world.

But Mr. Carling didn't see it that way. Mr. Carling was a tired, mousy little man who had taught too many courses in Plane Geometry and Algebra II. There was no mystery or magic in it for him. As soon as school was over he had to change to his good, brown suit and other shoes and go out selling ready-made suits of men's clothes. Sometimes he even let the class wait while he was showing samples to one of the other teachers.

Even so, Eugene Montgomery doggedly solved all the unreal problems assigned by Mr. Carling out of the textbook fairyland that didn't fit any world either of them knew anything about. He got a straight A all the way through, too. He accepted Mr. Carling's word that geometry was very useful to a manufacturer in knowing how many dustpans he could press out of a certain amount of sheet metal, and it helped the oil companies in knowing how many ships they'd have to have to transport so much oil across the ocean. He gave up the vision of a world of abstract beauty and light he'd glimpsed before encountering Mr. Carling and the ready-made suit business.



Mr. Pond, the physics teacher who didn't like confusion in the physics lab, so there had been no lab work during the course —

Mr. Raily, who was very solemn, and spoke every day of the obligations of world citizenship and the duties of the individual toward his group —

Miss Thompson, who couldn't explain why it was necessary to diagram English sentences, but for whom he obediently did it —

Professor Adams, who constantly interrupted his lectures on Statics with remarks on the high obligation of the engineer towards his profession and the public to see that only standard practices are ever employed —

To each one he had adapted himself. They poured it out in lectures and texts. He gave it back in examinations and recitations. And they commended him for his high scholarship.

And none had ever asked: "Do you have an idea that is better than this, Eugene Montgomery?"

No one had ever asked if he had any ideas at all. It didn't seem to matter. As long as he could function as a mental brick wall, bouncing back all they gave out, it was adequate.

But it had been pleasant — warm and friendly and pleasant. He remembered those years as the best of his life. There was no terror there. It was absurd to —

Now it was coming back. Slow, dark waves lapping at the edge of his mind. And he knew why it was there — yes, because he dared look upon himself as a student. The dark, lapping waves were the alternative to docile obedience and absorption of all he was taught. He would have brought them swirling up uncontrollably about his head in those high-school years if he'd dared allow himself to think Mr. Carling was an old fool, deaf, dumb and blind to the wonder of the beautiful thing he was murdering. There might have been a dozen in that class who could have been shown its light and beauty if their tender vision had been nourished carefully.

But Mr. Carling made certain they would never see. With his steady bumbling, that was in itself the peak of efficiency, he blinded their eyes beyond all recovery. And that was his purpose, Eugene Montgomery thought in sudden agonizing fury. Everyone knew it. Principal Martin, the School Board, everyone in the community — there was no one who was not aware of what little suit-salesman Carling was doing. And they did nothing about it.

Homeostat. He fastened down efficiently and tightly his little homeostat that said you mustn't see this beauty — it leads along too many strange paths to too many strange worlds. It's an ugly thing that you must hate forevermore.

Montgomery had known what was happening even as his own vision closed, and he was helpless to do anything against it. If he had tried to oppose them, even in his private thoughts, he would have been a prey to panic. Now, with the help of the Mirror, he could watch it creeping up on him, feel it flowing through his veins — and not succumb to it. Rather, he felt a strength rising up in him for having dared look upon this hidden nightmare, and slowly the dark lapping waves receded until they were all gone.

He sat there for a long time, waiting for something more. But he knew that was all for the present. He had seen himself for what he was and he had to live with it and understand it. Obsequiously, he had knuckled under to every whim of dogma handed out, never daring to question or propose a radically different thought of his own.

He was a coward. But he could look upon that naked, unpleasant fact now without flinching because he knew that somewhere in the Mirror he would find the means of changing it.

V.

He called at the office where Don Wolfe was waiting for him, to let the counselor know he was leaving, but he didn't feel talkative and Wolfe let him go without pressing him for conversation about what he had found.

He ignored the call which the desk clerk said had come through from Dodge. He had reported once today; that was enough. He requested that he be not disturbed by calls of any kind during the night.

It seemed impossible to sleep and he lay for a long time looking down at the rocky shore and the narrow strip of sand at the base of the jutting cliffs nearby. His mind was swarming with confused, tormenting thoughts, and yet he seemed almost able to stand aside, viewing them objectively and without panic.

He seemed to have come a far way from the Firestone Aviation Corporation and the XB-91, where all this had begun. He wondered how Soren Gunderson was making out, if the designer's experiences were as rough as his. He didn't see how they could be. Gunderson was successful and creative.

It seemed to Montgomery that he had almost forgotten the original purpose of his coming. But he had to remember it and evaluate it anew. Was the work of the Institute a hoax and a menace for Dodge and Spindem to bring to a halt? He thought of the Norcross demonstrations with fresh excitement. There was nothing phony about them, he was certain now. He had no positive evidence to support it. His own experience had convinced him. Years of unrecognized but ever-present tension and fear were gone. He could look upon the reality of his own failings without shrinking from the sight.

His position was reversed. He was no longer an agent of Dodge to find a legitimate excuse to close up the Institute. He was an Institute agent who had to find means of persuading Dodge that something of value existed here.

He didn't know how this was going to be done. Perhaps he ought to go to Nagle and Berkeley and confess why he had come. But it wasn't as easy as all that. He was still under orders from Colonel Dodge.

Soren Gunderson was in a foul mood when Montgomery found him the next morning. He was sitting on the lawn near one side of the court, talking with a younger man. His face was dark and unpleasant in a way that Montgomery had never seen before in all the years of their association. Gunderson was ordinarily placid and easygoing.

He motioned to a seat. “This is another of the new supermen. Major Eugene Montgomery of the United States Air Force; Mr. Mahlon Rockwood recently of Acme Refrigerators, Incorporated.”

The two men shook hands, smiling at each other a trifle uneasily in Gunderson’s dour presence.

“Mr. Rockwood has some interesting observations on this matter we’re all interested in,” said Gunderson. “He thinks our friend Nagle is pretty much off the beam in laying so much blame on the schools for the widespread technological stupidity.”

Montgomery grinned sympathetically. It was obvious that Gunderson was trying to unload something extremely potent, and hadn’t succeeded yet. He turned inquiringly to the younger engineer.

“I was just saying that most new engineering graduates can’t take the risk,” said Rockwood. “As in my case, most of the fellows are working at a place where sales are doing nicely on the old lines. They’re buying a twenty thousand dollar home in somebody’s development — which will have cost them twice that before it’s paid for in thirty or forty years. They’re expecting to send their own kids to college — they’ve got one or two now and expect more. They can’t risk badgering the chief engineer or the factory manager or the sales chief to come out with something new that might upset the whole refrigeration business, for example.

“So for the new model they decide to hang a butter softener in the door. Or maybe put the coils in the walls — and take them out next year. Then if they feel real daring they’ll do something drastic like revolving shelves — produce a real contribution to the science of food preservation!”

Montgomery laughed. “Almost as good as the calico doors we had a year or two back.”

Rockwell nodded. “But that’s the situation we’re in, and I wonder if it doesn’t extend even into the aircraft industry in a different form. Nobody in any kind of business wants to change his model as long as the old one sells. That’s the basic fact that everybody’s overlooking. And when a change is made it must be a minimum — not a maximum — change. Every engineering professor in the country seems determined to keep this a deep, dark secret.”

Gunderson snorted. “Wouldn’t it be nice if it really were that simple?” He turned to Montgomery. “I’m kind of sorry I got you to come up here with me, Jack. I really thought these guys had something. I guess maybe they still think they do. But they just don’t know what they’re bucking.”

“What are they — and we — bucking?”

“Ever hear of ‘steam-engine time’?”

“No. What’s that?”

“Some mystic named Fort thought up the term. It means that when a culture has reached a point when it’s time for the steam engine to be invented the steam engine is going to be invented. It doesn’t matter who’s alive to do the inventing, whether it’s Hero of Greece, or Tim Walt of England, or Joe Doakus of Pulaski — the steam engine is going to get invented by somebody. Conversely, if it’s not steam-engine time nobody under the sun is going to invent it no matter how smart he is.

“Others have put it a little more elegantly by saying that it is impossible for one to rise above his culture. That’s the thing we’re trying to buck — and we can’t do it.”

“If that were true, there would be nothing but stagnation. Somebody has to rise and draw the culture up with him.”

“No, no —” Gunderson looked almost angry. “Take mathematics for example. A mathematician does his building on the foundation that’s already there. Nobody in Pythagoras’ time was going to invent tensors or quaternions. The culture for it wasn’t there. Suppose Einstein had been born in a Polynesian tribe. Do you think he would have produced his work on Relativity in that culture?

“Uh-uh. And it doesn’t matter how smart we are or how much we get our brains polished up in the Mirror — we aren’t going to take the next steps we want to take until the culture is ready for them. That might be fifty years from now, for all we know. You can’t lick the principle of steam-engine time.”

“So what are we going to do about it?” said Montgomery. “Sit back and wait until steam-engine time catches up with us?”

Gunderson glanced up, his eyes dark, knowing Montgomery was mocking him. Instantly, the major regretted his words. “I didn’t mean it that way — I think you’ll find the answer in the Mirror.”

“That’s what Nagle keeps telling me! We went round and round over this yesterday, and all he’d do was smile and tell me to look in the Mirror.”

Montgomery didn’t know the answer to the argument of steam-engine time. Maybe a man couldn’t rise above his culture. He doubted, however, that he had to remain immersed to eye-level height in it forever. But he knew now, at least, what was holding Gunderson back! He wondered what the engineer would find when he searched the Mirror for the answer.

He went almost reluctantly to the appointment with his own Mirror. He felt he had reached a position of equilibrium which he hesitated to disturb. Admitting his own cowardice and inadequacies was more pleasant than what he might find next.

A world of nightmare swarmed up to meet him as soon as he

donned the headpiece. He thought he was prepared for almost anything the Mirror could show, but this was something new.

He had found out how to control the speed, so to speak, of his approach to the image, and he held it down now, feeling his way slowly through the bewildering unknown. It was difficult to keep aware that this was the labyrinth of his own mind he was searching. He couldn't believe that he had walked about daily for his thirty-five years with this nightmare and terror locked up inside him.

It seemed as if all the normal quality of his senses had been stripped away. He had no eyes to see, nor ears to hear, nor fingers with which to feel. But there was awareness of life, a sharp, ecstatic awareness that filled his whole being. It was intense, as if it alone occupied the whole world.

And then there was — death!

It had been approaching for long aeons, slowly dimming the ecstasy. But he screamed aloud when he finally recognized it for what it was. The gradual diminishment of life was like a fire going out in all the cells of his being, and the coursing liquids slowed and turned cold.

He fought back to awareness of his body, and knew he was dying — now. He felt it in his arms and legs. His heartbeat was slow and his breath came in gasps that had all but ceased. He couldn't find light with his eyes any longer. There was only the great, empty shadow into which he was slowly drifting. This was death.

At first he could not discern the enemy. He had believed there was no life but his own. Now he was aware that there was life all about him. While his own was decreasing, this other was growing, drawing from him his own vital force of existence.

He reached out involuntarily to struggle against that enemy and felt it react. He felt the sick flood of its revulsion wash through him, poisoning, destroying. But an understanding came. He could make a bargain —

The enemy was supporting him — how, he didn't know. But his demands had been too great. The enemy rebelled for its own safety and had begun first to withdraw its support, then actively attack him. He could offer to curb his demands, to lessen his requirements. Then they could both survive. He didn't know if it would be accepted. He was at the mercy of the other. But he sent out his offer and his appeal —

Faintly, the fires seemed to rise in the distant cells of him. The liquids were renewed. His offer was acceptable. His life was restored to him again.

But not so high as before. Some of the ecstasy was gone, and the fear remained — the deadly fear that if he demanded his full portion he would be annihilated.

Where did such a nightmare arise? It had diminished, but he was still shaking in every muscle as he became aware of the panels of the Mirror. Perspiration soaked his clothes.

It was nothing that had ever happened to him. Of that he was certain. For some reason his imagination had been harboring this fantasy of death, controlling him with it. It had to be a symbol of something else, having no reality in itself.

Hesitantly, he glanced at his watch and then at the panels of the Mirror. It didn't seem possible that he had spent half a day with it already. He ought to call it enough for now. Wolfe had cautioned him to not spend more time than this at a single sitting. But he had to get another look at that symbol of terror and find out its meaning. If it had one —

He went back again and again to look more closely each time, to feel more intimately the sense of death. Until at last he was able to look continually without cringing.

It was late evening when he took off the headpiece. A faint smile was on his lips as he closed the door of the room behind him.

He spent two hours more searching the stacks of the fairly ample library of the Institute. Then he returned to the hotel, and his smile was broader than ever as he entered the door. The psychiatrist, Dr. Spindem, was waiting for him in the lobby.

He arose and came forward, hand outstretched to greet Montgomery. His face was beaming professionally and his eyes scanned the major intently.

"I came as quickly as I could," he said. "I told Colonel Dodge we couldn't afford to endanger unnecessarily a man with your qualifications."

Montgomery chuckled. "I can imagine what Dodge's answer was!"

"What do you mean by that?" Spindem's eyes sharpened their inspection.

"Nothing — particularly."

"You mean you feel the colonel doesn't appreciate you?" Spindem insisted.

"Something like that," Montgomery agreed. "Would you like to come up to my room where we can talk?"

Spindem nodded. "Yes. I want to hear everything you've found out so far about this incredible, so-called Institute."

The psychiatrist remained silent during the ride in the elevator and the walk to Montgomery's room. But the major could feel the constant inspection of his eyes almost as if it were a physical probing. He guessed that he was already written pretty far down in Spindem's little black book.

"Drink?" he offered as they sat down. "I haven't anything here, but we can have something sent up."

"No, thanks," said Spindem. "I'd like to hear immediately everything you've experienced — particularly about this so-called Mirror."

Montgomery began with his experiences of the first day, describing in detail the demonstration put on by Norcross.

"What do you suppose the purpose of that was?" said Spindem. "Is it a standard sort of show which is put on for all newcomers?"

"It's no show. I thought it was faked up, too, when I first saw it. It isn't. It's genuine. The men who have gone through enough hours with the Mirror can actually do those things."

"Some form of hypnosis, unquestionably," said Spindem. "You'll pardon my disagreement, but you understand, I'm sure, that my professional experience enables a more accurate interpretation of such mental phenomena."

"Of course," said Montgomery. He continued with Dr. Nagle's analysis of the educational system as a homeostatic mechanism and his own verification of this function.

"A novel concept," said Spindem, "and obviously very naïve, not taking into consideration at all the converse situation if there were no universal distribution of knowledge."

Montgomery started to interrupt, but the psychiatrist continued. "I am most interested in your statements about your high-school mathematics teacher. You say you believe this Mr. Carling purposely and deliberately made geometry and algebra unpleasant to you so that you would not pursue them too far?"

"Paranoid, I believe you call an attitude like that, don't you?" said Montgomery, his face expressionless. "A persecution complex —"

"Please —" Spindem's face looked pained. "I am not here for the purpose of personal diagnosis, major. My only interest is in the effects of this Mirror."

"I'm sorry," said Montgomery. "Your question permits of no simple answer. Mr. Carling was utterly incapable of teaching mathematics in any way that would not make it completely repulsive. The subject held no fascination for him, and it was inconceivable that it should for anyone else.

"The principal was aware of Carling's work, but *he* didn't know there was anything wrong with it, either. The School Board knew the principal's feelings and attitude and considered him a fine man for the job. Everyone knew - but nobody believed anything needed to be done about the situation. And Carling went on turning out his scores of pupils, year after year, who hated mathematics with an almost personal bitterness."

“That is hardly to say that all this was deliberate and purposeful, even if completely true,” said Spindem.

“I thought psychiatry was the first to deny that any accident exists in human performance,” said Montgomery. “Your teachings are that when an effect is produced by human beings it was the intention of those persons to produce that exact effect. You are familiar with the individual subconscious, but there is a group subconscious, as well. No one would ever admit it was the purpose of my school to produce haters of mathematics. I say it was the purpose — the unstated, subconscious purpose of the entire group involved.”

Spindem made no comment. His lips pressed together in a thinner line as his eyes scanned Montgomery’s face intently.

“And the Mirror told you this?” he said finally.

“I was able to determine it for myself, after the Mirror minimized the fear of recognizing this fact.”

“And why should there be any fear in recognizing it — if it were true?”

“Because of the unevenness of the contest: me against the whole educational system.”

“Or the educational system and society against you?” said Spindem with lifted eyebrows.

“Either way you want it,” said Montgomery.

“And is there anything else you have determined from looking into this Mirror?”

“Yes. I found out why I didn’t have more courage and gumption to stand on my hind legs and protest people like Carling and his kind. There are other people who have made more of a stand than I have, as is obvious to you. But I simply knuckled under.”

“Why?”

Montgomery told then of his long experience with the Mirror that day, the sensation of death and an enemy with whom he compromised to save his life. Spindem listened with interest.

“Have you dreamed previously in this same manner?” he asked as the major finished.

“It was no dream,” said Montgomery. “I was wide-awake.”

“Of course. In the case of this afternoon’s experience — but I would think the same symbolism had probably occurred frequently in dreams during your lifetime. Unless it were induced wholly by the Mirror.”

“It was not induced by the machine, and it was not symbolism,” said Montgomery. “I can tell you exactly what it was.”

“Please do.”

“I wasn’t quite sure of myself even after a whole day with this experience,” said Montgomery slowly. “I spent a couple of hours

afterwards brushing up on my psychoanalysis a bit, to see if it was creditable in terms of your field.

"I find your authorities agreeing almost universally that the psyche of the individual has an unknown beginning and a long history antedating the event of its physical birth. My experience with the Mirror confirms it. I was a living, responsive entity at the time my mother's organism tried to destroy me. The event I spoke of was a threatened miscarriage. Through the endocrine flow that passed between us I recognized that I was being killed. Poisons were beginning to circulate within me and essential elements withheld.

"There was the impression that the maternal body was too weak to support me. My growth demands were too great, and the only way it could survive was by destroying me. And then, on a biochemical level, I made a bargain. My organism agreed with the mother organism to accept less, to limit my demands for sustenance in exchange for the right to live. The bargain was made and kept.

"That was my first major piece of education. I learned that in order to live I must limit myself, always take less than I need, diminish myself to the subsistence level in every way. That was a pattern I have maintained throughout my life. I have never dared create — to do so meant death. I learned that long ago as a fetus, and the lesson remained until today."

Dr. Spindem took a deep breath. "Major, you leave me no doubt about the absolute danger of this Institute. You are treading in the most dangerous areas of human experience. Of course we admit that the human psyche does not come into existence at birth. But it is utterly impossible for you to know that the things you have described ever took place. Even admitting that these fantasies are your own and not the induction of this machine, it is mental suicide to attempt your own interpretation. Only a skilled and experienced professional mind could possibly provide you with a proper understanding of them."

"In the Forties," said Montgomery, "one of your own people, the Hungarian psychoanalyst, N. Fodor, showed a practical method of reaching the pre-birth unconscious and de-educating the individual in the lessons learned there which are no longer applicable to post-birth life. You cannot deny the validity of it. The Mirror is simply an extension and improvement over Dr. Fodor's findings. Tomorrow I shall prove it to you."

"How?" Spindem demanded.

"Tomorrow I shall create something for the first time in my life. I shall create an airfoil which will revolutionize high-altitude flight."

Dr. Spindem stood up. "It is obvious, Major Montgomery, that you have endured a terrible ordeal at the hands of these people who operate this pseudo-analytic device they call the Mirror. It is my

professional duty to recommend to your superior, Colonel Dodge, that you be withdrawn from the project immediately. Adequate evidence already exists to force the closing of the Institute. It is morally impossible to allow you to risk your mind further.

"For yourself, I must recommend immediate therapy. In order to minimize the danger of delay I would suggest we arrange for tomorrow morning the first of a series of electroshock treatments for you. If treatment is begun at once, the effects of this terrible experience should begin to disappear within five or six weeks."

"Not tomorrow," said Montgomery. "I have to design an airfoil. Perhaps in a day or two after that."

VI.

He gave the white-faced Spindem an hour to call Colonel Dodge. Then he placed his own call. At Dodge's first word he knew he had guessed correctly. Spindem had said his piece and Dodge was most sympathetic and solicitous.

"My dear major," the colonel said. "I was just about to call you. I want to offer my congratulations and my sincere thanks for the job you have done for us. It's as much as any man could be expected to perform in line of duty and I'm —"

"So Spindem called and told you I was nuts, huh?"

"What's that, major? Oh, yes I did hear from Dr. Spindem this evening. He said —"

"Colonel Dodge, I want you to come out and see this thing for yourself. If I'm crazy — all right, I'm willing to gamble my sanity for what I've seen out here. This isn't a fake, colonel, or a scheme of sabotage, or anything of the sort. If you think it is, after making a personal inspection, I'll let Spindem fry my brains in an electric toaster for as long as he wants to. But I ask you to come and make your own decision before taking any further action against the Institute."

"That is reasonable," said Dodge carefully, as if he felt he were talking with a child or idiot. "As a matter of fact, I intended to do that anyway. But don't you think you ought to let Dr. Spindem —"

"*After* your decision, colonel!"

There was a pause and Montgomery heard the colonel's sigh of irritation.

"I'll make it as quickly as I can, but it may be three days at least, before I arrive. Keep in touch with the doctor. Don't take any unnecessary risks."

It probably would look bad, Montgomery thought, if he had to be committed to an institution, and word got out that it had resulted from an assignment the colonel had made. Dodge had reason to worry, he supposed. At least, he thought he did.

Montgomery ate quickly in the coffee shop of the hotel. It was still early enough to get in another three or four hours at the Institute. The place seemed to be open most hours of the day or night.

He met Wolfe as he passed along the loggia.

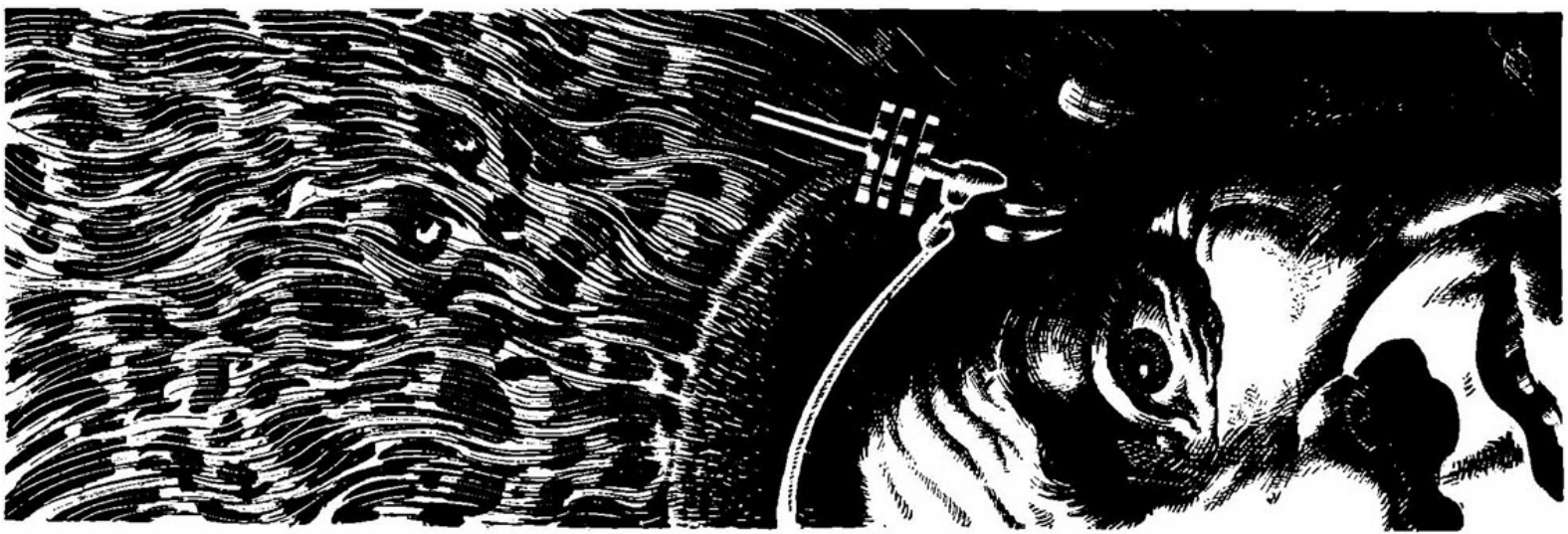
"I'm afraid I can't allow you any more work for at least a couple of days," said the counselor. "I just looked over the Mirror tapes you turned out today —"

"That's all right," said Montgomery. "I wasn't headed for the

Mirror. Now that I've gotten rid of a big chunk of my education I want to do some learning! It will be O.K. for me to work with the shadow boxes, won't it?"

Wolfe nodded dubiously. "Don't keep at it too long. You can say you've really had it!"

Montgomery found an empty learning room and sat down before the cube of the small shadow box there. Gingerly, he put on the headpiece. It was the first time he'd tried it — and even now he was glad he was alone.



The soft glow came on in the interior of the cube. Montgomery hesitated and drew a deep breath. Then he projected an image of the Ninety-one.

He almost cried at the result. A fuselage that looked somewhat like a contorted carrot sprang into being — minus wings and engines. He tried to straighten out the shape and the tail disappeared. He let it go and attempted a wing. The whole fuselage vanished and one wing, with a single engine flaming, turned slowly end over end in the cube.

Montgomery leaned back in sick discouragement, and removed the headpiece. He had thought it would be so easy once his pattern of action ceased to inhibit his creativeness. The lesson of his pre-natal threat of miscarriage was gone. The lessons of Mr. Carling, who had taught him to hate beautiful geometric forms, were gone.

Professor Adams, who permitted standard engineering practices only — and those no more recent than 1908 —

They were all gone, and he was like a child, crawling on the floor, stacking his first blocks. He had to learn skills with the unused faculties and in that there was agony.

He tried again, building a wobbly plane with melting wings and twisted fuselage. But no panic swept him as he persisted. He was free to learn and create for the first time in his life. He forgot time, and the sun was tinting the beach when he finally looked up from the cube with a small degree of satisfaction with what he had produced. The plane was recognizably a miniature of the XB-91, and it didn't melt and wobble as he tried to maintain its image.

But he had been wrong in his statement to Spindem. Today was not the day he would create a revolutionary new airfoil. He could put it on paper, of course, but that would be a last resort. He wanted to provide a solid model that could be checked in a wind tunnel.

He went to the hotel and caught a few hours sleep. Then he came back to the Institute and resumed work to improve the accuracy of his visualization. For another forty-eight hours he sweat over the project, breaking up the long sessions with the shadow box for only brief intervals of eating and sleeping.

But at the end of that time he was satisfied with his achievement. He had a foot-long model of the Ninety-one with a wing such as no one had ever seen before. He solidified it in plastic.

He called in Gunderson, who was looking much better, as if some of his own problems had been solved. Montgomery didn't ask what kind of experiences he'd been having with the Mirror, however. His time was almost gone.

"I've got to have some wind-tunnel tests by tomorrow afternoon," he said. "Firestone's little variable-pressure tunnel is the only one that will do. I'm completely bushed. Will you fly up there and run the tests

and get them back by tomorrow?"

Gunderson picked up the model, keeping his face straight. He ran a finger over the contour of the wing. “Is this the thing you talked to me about when we built the Ninety-one’s wing?”

Montgomery nodded. “I know it looks nuts, but I haven’t got time to argue it now. If I’m wrong about it, the Nagle-Berkeley Institute closes as of tomorrow night, and ten years of litigation will probably not get it open again.”

“What are you talking about? Who’s going to close up the Institute?"

Quickly, Montgomery told the engineer why he’d come there in the first place. He told of the country-wide suspicions of the motives behind the Institute, of the approaching visit of Colonel Dodge.

“Dodge will obtain an injunction to close them up. He’ll string out an investigation forever. Nagle and Berkeley will struggle for the rest of their lives to get into operation again, but they won’t have a chance. Opinion will be wholly against them in all quarters of conventional authority.

“On the other hand, if we can swing Dodge to our side when he comes —”

Gunderson shook his head slowly as he looked at the model plane once more. “You think this will do it?”

“Look.” Montgomery turned back to the shadow box. He turned it on and created another image of the Ninety-one. Then he provided a visible air stream. “I’ll vary it now to simulate flight between eighty and a hundred thousand feet.”

Gunderson watched as the luminous streamlines thinned. The model rose at a scale speed that was fantastic. “But *you're* doing that!” he exclaimed.

Montgomery nodded and turned it off. “That’s why I have to have the wind-tunnel report to convince Dodge. But the model will behave exactly that way in the tunnel. The lift of the wing is about ten per cent less than conventional shapes at sea level. At the flight altitude for which it is designed, however, the lift actually increases with rarefaction of the atmosphere.”

Gunderson’s face still showed disbelief, but he picked up the model. “I’ll get the tests for you. As for Dodge, aren’t you going to tell Nagle and Berkeley? And haven’t they anticipated something of this kind?”

“Yes,” said Montgomery. “I’m quite sure they’ve anticipated it. They’ll know why Dodge is here.”

Montgomery went to his hotel to rest. He had done all he could. Maybe it wasn’t enough. Maybe Nagle and Berkeley would have come

out better with somebody else in his place. But it had to be played now the way it lay.

He called Dr. Nagle and talked with him for fifteen minutes in regard to Dodge's visit. As he suspected, the only thing that was news to Nagle was the time and the person who would initiate the investigation. It was agreed that Montgomery would bring the colonel over and introduce him and take part in the demonstration that would be given.

With this in hand, Montgomery went to sleep for the rest of the day.

Gunderson returned to Casa Buena the following day, an hour before Dodge's shuttle plane from Oakland was due. The engineer went directly to Montgomery's hotel. His hands were trembling faintly as he unfastened the brief case and handed Montgomery the sheaf of papers reporting the wind-tunnel performance of the model plane.

"This is the biggest thing since jet engines!" he said. "If a full scale design would give the same performance — You should have seen Evans and the rest of the wind-tunnel gang standing around with their mouths open as lift increased while pressure went down. Here's the curve we got."

Montgomery scanned it with satisfaction. It was just about as he predicted. There was the normal rate of loss from sea level to fifty thousand. It began to pick up a trifle there, and at eighty thousand the sharp, useful rise began. At a hundred thousand it plummeted again.

"If we'd only had that on the Ninety-one —" said Gunderson.

"We could have — if I had been able to take a look at myself in the Mirror early enough."

Gunderson left. Montgomery went out to the small airport at the edge of town to meet Colonel Dodge, who arrived exactly on schedule. Dr. Spindem came along, of course. He seemed uneasy at the prospect of riding with Montgomery, but said nothing. There had been little conversation between the two men since the night of Montgomery's report.

As the plane's passengers disembarked, Dodge approached with cordial concern on his face. "It's good to see you again, major. How *are* you? And Dr. Spindem —"

"Everything is fine," said Montgomery. "I have explained your visit to Dr. Nagle. He has prepared a small demonstration which I'm sure you'll enjoy."

Dodge's lips compressed. "I'm sure I shall," he said.

The colonel took a room at Montgomery's hotel. In a half hour he was ready, after a shower and change of clothes, to go to the Institute. It was a half hour, however, in which Spindem conferred with him,

while Montgomery waited in the lobby. The major was aware of a sharp change in Dodge's expression as he came out.

Dr. Nagle seemed perfectly composed, however, as he received the unsmiling colonel, and the faintly contemptuous Dr. Spindem. He and Montgomery smiled at each other as they shook hands.

"I understand you have come to close us down," he said abruptly as they took chairs.

The abrupt challenge startled Dodge, but he yielded no ground because of it. "We have obtained an injunction," he said severely, "which we are prepared to exercise, on the grounds that you have hampered the military effort by inciting men to leave critical posts."

"That is a rather severe action in light of our concept of freedom to move about and do as one thinks best. You have no moral control over these men."

"These are severe times," said Dodge. "But in fairness we are prepared to listen to an explanation of your actions — if you care to give one."

"I should like to," said Dr. Nagle, nodding slowly.

He outlined his beliefs regarding the untapped resources of the human mind as he had done on Montgomery's initial visit. The colonel listened with interest, but without conviction.

"All that is most interesting," he said, "but our institutions of learning and research have been at work on the problem for thousands of years. It is hardly likely that they would have failed to find a solution if one were as readily available as you suggest."

"Suppose we view the demonstrations next, then?" Dr. Nagle suggested.

"I should like to say something at this point, gentlemen," said Spindem suddenly. "In my field of work this search for supernormal faculties and functions of the human mind is recognized for what it is. The constant pre-occupation of our society now with schemes of a fantastic nature is pathological in the extreme. Among these we have the Superman fad, the popular dissertations on means of leaving the Earth and going to the Moon, Mars, Venus, et cetera. We have the yearning for means of telepathic communication — anything to circumscribe the necessity for utilizing and perfecting the conventional means at our disposal. It is too much hard labor to understand another man or another nation by perfecting vocal and written means of exchange. If we only had super powers, such as telepathy — presto! — all our difficulties would be over.

"Your assertions are suspiciously pathological, Dr. Nagle. We will improve Man when, and only when, we inspire him to hard work in use of the faculties with which he is normally endowed, and cease to search the clouds for something miraculous."

Dr. Nagle smiled slowly. “Your last statement inspires my wholehearted enthusiasm, Dr. Spindem. And now, the demonstrations, gentlemen —?”

Montgomery had suggested that they not use the musical demonstration, or the similar artistic one, but Nagle had Norcross perform an original symphonic composition. Dodge knew Norcross by reputation and slight personal acquaintance. It was obvious that he was not impressed by the engineer’s performance. He simply didn’t believe it. He was furiously attempting to devise in his mind a solution to explain the mechanical trickery he thought he saw. To explain the mechanism involved, the reason behind Nagle’s use of it — and Norcross’ reasons for participating in it. He got no answer to any of the items.

Spindem, on the other hand, was rather entranced by the music. He listened uncritically, as if he could believe, for the moment at least, that it was being produced in the manner Nagle described.

There was a demonstration of art work, produced in full color in the shadow box. A half dozen students went through as many complicated problems of electronic design. Civil engineering and aeronautical designs were created in profusion.

It seemed to Montgomery that the very weight of material shown should break down Dodge’s skepticism, but he remained unmoved.

“I have seen nothing yet for which I could accept your explanation, Dr. Nagle,” he said. “These mysterious shadow boxes of yours — I’m afraid a much easier explanation for them can be found —”

“You will be allowed the opportunity,” said Nagle. “But we have saved the most important item until last. This was produced by one of your men —”

He drew out Montgomery’s model and specification sheets along with the report of the wind-tunnel tests made at Firestone.

“What’s this?” Dodge demanded. Then he bent to an examination of the articles before him. After five minutes he glanced up in disbelief. He sat down at the desk and read and reread the papers.

He looked up a final time, searching for Gunderson, who had been brought in at this point. “You conducted these tests yourself, and can verify this report?” Dodge asked him.

Gunderson nodded. “It's absolutely true. The Firestone lab crew will vouch for it, too.”

“This is amazing!” said Dodge. He got to his feet and faced Nagle. “At least you have one genuine item that is difficult to discredit. But there is still nothing in it to convince me that your Institute had anything to do with enabling the inventor to produce it. I fail to see

how —"

"The man responsible for that design is well known to you," said Dr. Nagle. "It is the work of Major Eugene Montgomery."

There was ten seconds of absolute silence in which Dodge turned slowly to face the major. His face was incredulous. "Montgomery," he breathed, "you —"

Major Montgomery held up his hand. A bitter smile was on his face. "Let me say it, colonel. I think I can make it easier for you. I know the whole story — and I doubt that Dr. Nagle knew that I was fully aware of it.

"He and Dr. Berkeley were most certainly aware that they could not disrupt the military production of the country without producing severe repercussions. They prepared an answer. I'm it.

"I caught on pretty early. At first I was puzzled that they would even let me in. Everybody else around here ranged from competent to genius. I was the only knucklehead in the whole bunch. Then I understood. I was to be the horrible example. If something could be made out of *me* —

"You knew, of course, that all my associates considered me a first-rate dope," he said to Nagle. "I imagine Gunderson must have been in on it, and given you a thorough run-down on my incapacities. I know now that I was assigned to the Ninety-one simply because that project was too big to be loused up by me. Isn't that it, colonel?"

"Montgomery, I didn't mean —" The colonel dropped his hands to his sides.

"It's all right," said Nagle, smiling. "Major Montgomery doesn't mind at all that you had him classified as a mental butterfingers. The important thing is that he no longer is such. He designed this new wing. The incompetent, fearful Montgomery you have known could not have done it. It required the changed, courageous Montgomery who has taken a look in the Mirror and knows what he is capable of doing and is no longer afraid to do it."

Dodge was silent, then suddenly he grinned and thrust forward his hand to Montgomery. "I guess there's no use denying we've had you pegged for a blockhead right from the beginning. We put you in Firestone because it was a place where you could strut around to your heart's content without really hurting anything.

"But if these people have done something to you to enable you to create a design like this — well, we're going to have to find out what it is. I want a look in this Mirror for myself!"

Dr. Spindem opened his mouth tentatively for the first time. His lips moved as if he were having difficulty in speaking. He said finally, "I've always fancied myself something of a musical composer. Do you suppose there would be any chance —?"

When the others had gone, Montgomery remained alone with Nagle. They went back to the director's office.

"I hope you honestly have no regrets that we chose to use you for a guinea pig," said Nagle. "Everything began moving in on us much faster than we had anticipated, your R&D, the FBI —"

Montgomery shook his head. "I have no regrets. All I ask is that I be allowed to finish now, on the same basis as the others."

"You don't believe you have finished? How far do you think there is to go?"

"I suppose that's the routine you give everybody," said Montgomery. "At least, I hope you're not trying to brush me off. You told me I could look in the Mirror and ask myself who I am and what I'm doing. I did that."

"We are not brushing you off," said Nagle with deep sincerity. "A man stays as long as he likes. He finishes with the Mirror only when he is able to see nothing new in it."

"I got just a glimpse of an answer to the question of who and what I am. I'm a human being — Humanity."

Nagle nodded slowly without speaking.

"It's in me — all of it," Montgomery said. "There's something in me that has been alive since the first spot of slime was thrown up in the seas and energized by a photon to become a living thing — something that has not known death between that moment and now. And all its wisdom and learning is hidden in me — in you, and all of us. I want it."

"You can have it," said Nagle, "if you can accept the cost. You know what it's like. You've seen a little, but it's only a sparkle of light reflected in a drop of water, compared with the full, sweeping image available to you.

"You've felt a little of the terror that keeps men from dropping the old, outmoded solutions to problems and facing the problems anew to get fresh, workable answers. If you look any farther, you'll know that every man is the heir to all the terror and risk the human race has experienced in three billion years of development. It's the terror that plagues him in nightmares and insanities and whittles his abilities to those of a midget when he ought to be a giant.

"It takes courage. We can stop the Mirror down to a microscopic aperture, so to speak, but you have to contribute your own courage or you will see nothing. If you have it, however, you can make all the wisdom of the race your own personal possession. The kind of wisdom that enabled it to develop through three billion years of boiling and flooding, attack by all other life forms and slaughter by its own kind. He's made a lot of mistakes, but Man has become a very tough critter,

and his wisdom is enormous in a racial sense."

"I'll tackle it," said Montgomery. "I may not make it, but I'm willing to be one of the expendable ones."

"The expendable ones —"

"It's my own term, but I think it fits. I got a glimpse of what you meant by the homeostatic mechanisms of the race. The expendable ones are those who dare to attempt functioning without the homeostats.

"I thought that first day you were trying to tell me the homeostats should be destroyed, that the schools, for example, should be replaced. I see I misunderstood you. The school is necessary, so are all the other homeostatic mechanisms, in order for the race to function as a unit.

"The race can't afford to take a chance. It has to be sure its movement is in a forward direction. Sometimes we think it is going full speed in reverse, but over the last three billion year period the general direction has been forward and up. To make sure it doesn't go off at a wild tangent and lay itself open to every crackpot idea that comes along, it provides homeostatic controls to suppress the wild fluctuations of its members. The school, the church, the media of communication all act to inform the individual members that This is the Way. Anything else is out of line.

"The controls are pretty hard to keep in adjustment. They get set too low in periods of widespread, compulsory education, as you tried to tell me. Compulsion breeds rebellion, and the school begins to fail as a learning factor. It needs to be put back on the pedestal where it once was, and admission made a goal, not an obstacle.

"As it is, we are approaching a standstill. The One Right Way is suffused with bitterness and rebellion in all segments of society. The fire is burning pretty low.

"Steam-engine time is a fallacy. It's neither right nor wrong. The race moves forward because of individuals who throw off homeostasis and step out of their culture. It prepares them to take the risk which it cannot take. They are expendable. They may go in the wrong direction and be destroyed. This is of no concern. What matters is the one or two individuals who find a better way. They come back and battle the homeostasis to prove they've found it. Sometimes they haven't the courage to win this battle and the race has to wait for a better man, who can change the homeostatic setting of our institutions. This may be wasteful, but we get a picture of the alternative when dictatorships break up all homeostasis and substitute their own control."

"We hoped you would see it this far — and want to go on," said Nagle. "We pushed you pretty hard. Because we knew Dodge was

getting set to attack, we more than tripled the natural fear-level control ordinarily used. We couldn't wait for weeks, we had to have you now.

"Wolfe was sure it had cost you your sanity after that first run. I was a little worried, too, but I knew from your actions that you had to have a great deal of courage or you would not even be alive. I was certain you had faced death somewhere and had licked it positively and deliberately — at terrific cost to yourself.

"The threatened miscarriage was it. You were already so near death that only an organism of extreme determination could have fought its way back. I knew you could take almost anything."

"Expendable — almost from the very beginning!" said Montgomery with only the faintest trace of bitterness.

"Yes," said Nagle, "all of us. You'll find that a billion years ago the race began to prepare you for this moment. It wants us to take an assignment — if we're willing to accept it. A certain avenue is to be explored. Maybe it's a blind alley and all our work will end in failure. But we'll go down it alone. We can afford to take the risk. The race cannot. If we find it's a good way to go, the race benefits. If we make an error, the race will pass us by, being saved from going the way we have gone.

"It's a lonely business, but would you have it any other way?"